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For related information see also *Astronautics*.

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Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

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Includes aircraft simulation technology.

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07 AIRCRAFT PROPULSION AND POWER 2450

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Includes powered and free-flight trajectories; and orbit and launching dynamics.

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77 THERMODYNAMICS AND STATISTICAL PHYSICS N.A.
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) 2561
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 2561
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 2565
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS 2568
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 2568
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 2569
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 2569

89 ASTRONOMY 2573
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 2577
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 2579
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 2580
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 2582
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 2583

Note: N.A. means that no abstracts were assigned to this category for this issue.

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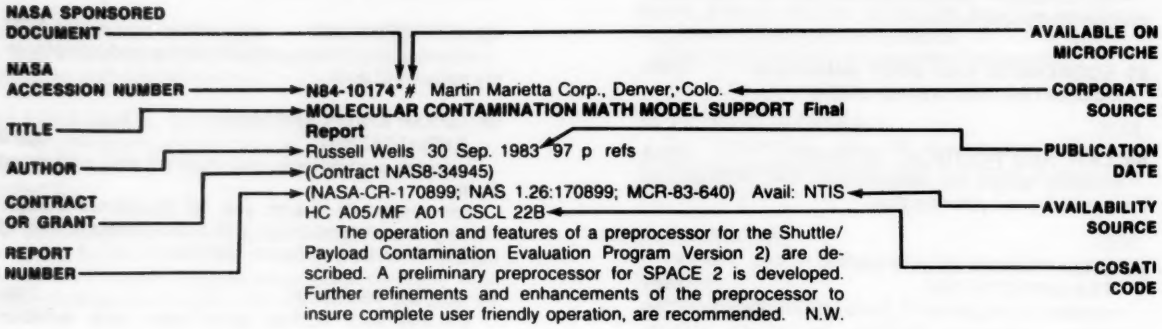
TYPICAL CITATION AND ABSTRACT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N84-10174*# Martin Marietta Corp., Denver, Colo.
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MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
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COSATI CODE
The operation and features of a preprocessor for the Shuttle/ Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

VOLUME 22 NUMBER 16/AUGUST 23, 1984

Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N84-25603* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING, A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 173
Apr. 1984 189 p
(NASA-SP-7037(173); NAS 1.21:7037(173)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 704 reports, articles and other documents introduced into the NASA scientific and technical information system in March 1984. M.G.

N84-25604* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 174
May 1984 129 p
(NASA-SP-7037(174); NAS 1.21:7037(174)) Avail: NTIS HC $6.00 CSCL 01A

This bibliography lists 466 reports, articles and other documents introduced into the NASA scientific and technical information system in April 1984. Author

N84-25605*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN ADVANCED PITCH CHANGE MECHANISM INCORPORATING A HYBRID TRACTION DRIVE
Bruce M. Steinetz, Donald F. Sargisson (GE, Evendale, Ohio), Graham White (Transmission Research Inc.), and Stuart H. Loewenthal 1984 18 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984
(Contract NAS3-23044)
(NASA-TM-83709; E-2137; NAS 1.15:83709; AIAA-84-1383) Avail: NTIS HC A02/MF A01 CSCL 01A

A design of a propeller pitch control mechanism is described that meets the demanding requirements of a high-power, advanced turboprop. In this application, blade twisting moment torque can be comparable to that of the main reduction gearbox output: precise pitch control, reliability and compactness are all at a premium. A key element in the design is a compact, high-ratio hybrid traction drive which offers low torque ripple and high torsional stiffness. The traction drive couples a high speed electric motor/alternator unit to a ball screw that actuates the blade control links. The technical merits of this arrangement and the performance characteristics of the traction drive are discussed. Comparisons are made to the more conventional pitch control mechanisms. Author

N84-25606*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN ANALYTICAL METHOD TO PREDICT EFFICIENCY OF AIRCRAFT GEARBOXES
Neil E. Anderson, Stuart H. Loewenthal, and Joseph D. Black (Allison Gas Turbine Operations) 1984 23 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984
(NASA-TM-83716; E2169; NAS 1.15:83716; USAAVSCOM-TR-84-C-8; AIAA-84-1500) Avail: NTIS HC A02/MF A01 CSCL 01A

A spur gear efficiency prediction method previously developed by the authors was extended to include power loss of planetary gearsets. A friction coefficient model was developed for MIL-L-7808 oil based on disc machine data. This combined with the recent capability of predicting losses in spur gears of nonstandard proportions allows the calculation of power loss for complete aircraft gearboxes that utilize spur gears. The method was applied to the T56/501 turboprop gearbox and compared with measured test data. Bearing losses were calculated with large scale computer programs. Breakdowns of the gearbox losses point out areas for possible improvement. Author

N84-25607*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF AN OPTIMIZATION METHOD TO HIGH PERFORMANCE PROPELLER DESIGNS
Ko Chang Li (Purdue Univ.) and George L. Stefko 1984 11 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984
(NASA-TM-83710; E-2086; NAS 1.15:83710; AIAA-84-1203) Avail: NTIS HC A02/MF A01 CSCL 01A

The application of an optimization method to determine the propeller blade twist distribution which maximizes propeller efficiency is presented. The optimization employs a previously developed method which has been improved to include the effects of blade drag, camber and thickness. Before the optimization portion of the computer code is used, comparisons of calculated propeller efficiencies and power coefficients are made with experimental data for one NACA propeller at Mach numbers in the range of 0.24 to 0.50 and another NACA propeller at a Mach number of 0.71 to validate the propeller aerodynamic analysis portion of the computer code. Then comparisons of calculated propeller efficiencies for the optimized and the original propellers show the benefits of the optimization method in improving propeller performance. This method can be applied to the aerodynamic design of propellers having straight, swept, or nonplanar propeller blades. Author

N84-25608# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
PROJECTS AND PROGRAMS AS A REFLECTION OF THE PERFORMANCES OF ENGINEERS IN AIRCRAFT MAKING BY HANS-WOCKE [PROJEKTE UND PROGRAMME ALS SPIEGEL DER LEISTUNGEN DES FLUGZEUGBAU-INGENIERS HANS WOCKE]
Heribert Flosdorff 1983 31 p In GERMAN Presented at VDI-Tech. Univ., Hamburg Kollog. zue Ehren von Herrn Senator E. H. Dipl.-Ing. Hans Wocke, Hamburg, Oct. 1983
(MBB-UT-24-83-O) Avail: NTIS HC A03/MF A01

Developments in the European Aerospace technology, and in particular the development of the European Airbus A300, are

described. Progress in aerodynamics, wind tunnel tests, statics and construction progress in the industry are outlined. Transport aircraft design and development are examined. The organization of a team of aeronautic engineers which has gained experience in the areas of construction, research and development, and management of international projects is discussed.
Transl. by E.A.K.

N84-25609# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AERONAUTICAL MATERIALS (SELECTED ARTICLES)
L. Wang, R. Chen, Y. Wang, P. Wang, and Z. Yang 13 Mar. 1984 178 p Transl. into ENGLISH from Hangkong Cailiao (USSR), v. 2, no. 2, 1982 p 1-7; 8-15; 16-22; 31-37; 38-44; 45-53; 54-59; 60-74
(AD-A139952; FTD-ID(RS)T-1868-83) Avail: NTIS HC A09/MF A01 CSCL 11/6

Several topics in aeronautics are discussed. The influences of directionally solidified techniques and hafnium content on a nickel base high-temperature alloy, and the effects of solid solution temperatures and cooling rates on the microstructures of BT 3-1 titanium alloy are among the topics discussed. R.J.F.

N84-25610# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
JOURNAL OF AERONAUTICAL MATERIALS (SELECTED ARTICLES)
R. Wang, X. Li, Y. Yin, M. Yan, and J. Tan 27 Mar. 1984 62 p Transl. into ENGLISH from Hangkong Cailiao (China), v. 2, no. 1 p 1-6; 19-24; 25-31; 40-46; 47-52
(AD-A140167; FTD-ID(RS)T-1869-83) Avail: NTIS HC A04/MF A01 CSCL 11/6

Various topics in aircraft materials research are discussed - including stress corrosion cracking of metastable austenitic stainless steel; wave grain boundary heat treatment for GH-220 alloy; heat treatment effects on fine structure and mechanical properties of ultrahigh strength steels; fracture toughness of acrylic stability of carbon fiber composite stiffened plates. M.G.

N84-25611# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
JOURNAL OF AERONAUTICAL MATERIALS (SELECTED ARTICLES)
27 Mar. 1984 120 p Transl. into ENGLISH from Hangkong Cailiao (China), v. 3, no. 1 p 1-12; 17-45; 58-58
(AD-A140181; FTD-ID(RS)T-1870-83) Avail: NTIS HC A06/MF A01 CSCL 01/3

The physical properties and mechanical behavior of various alloys and composite materials are discussed. Specific materials include titanium and other metal alloys, silicon carbide fiber reinforced aluminum composites, and glass fiber/epoxy resin composites; among the physical properties reviewed were superplasticity, notch strength, and tensile strength. The effect of various influences on such processes as solidifcation, curing, crack propagation, and thermal fatigue is presented. R.S.F.

N84-25612# Naval Postgraduate School, Monterey, Calif.
NAVAL AVIATION IMA REPAIR CAPABILITY: A READINESS TO RESOURCES APPROACH M.S. Thesis
D. R. Merrill Dec. 1983 103 p
(AD-A140465) Avail: NTIS HC A06/MF A01 CSCL 05/1

This thesis studies intermediate repair planning at the Naval Air Systems Command (NAVAIR) level. Maintenance information system initiatives (Naval Aviation Logistics Command Management Information System (NALCOMIS)/Naval Aviation Logistics Data Analysis (NALDA)/AIMD Performance Management System (APMS) and an analytical systems model (Analytic Hierarchy Process (AHP)) are examined. The study concludes that information system initiatives provide the performance measurement orientation and information processing base required in support of NAVAIR tactical planning. It further concludes that complex logistics problems can be modeled through the AHP. AHP is a promising technique for integrating performance information and expert opinion into a hierarchical, multiple objective planning structure. It provides a method for determining resource requirement priorities in support of readiness goals. The study recommends that research be expanded to include development of a NAVAIR decision support framework utilizing the AHP. GRA

N84-25613# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
WORKSHOP ON REQUIREMENTS FOR AIRCRAFT CORROSION CONTROL
W. M. Imrie, ed. Mar. 1984 78 p refs Workshop held in London, 10-15 Apr. 1983
(AGARD-R-714; ISBN-92-835-1467-X) Avail: NTIS HC A05/MF A01

Conference proceedings on aircraft corrosion and corrosion prevention are given. A number of topics are discussed in the areas of design specifications, manufacturing, maintenance, and cost. For individual titles, see N84-25614 through N84-25624.

N84-25614# Royal Aircraft Establishment, Farnborough (England). Materials and Structures Dept.
CORROSION CONTROL REQUIREMENTS FOR UK MILITARY AIRCRAFT **c26**
V. C. R. McLoughlin *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 5 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

The designer is given advice on the selection of materials based upon their resistance to corrosion, and mandatory requirements for processes and materials to be used in aircraft structures so as to minimize deterioration and corrosion. Details are given of these requirements and the various sequences of operations required for corrosion control purposes. R.J.F.

N84-25615# Naval Air Development Center, Warminster, Pa.
CURRENT PROCUREMENT SPECIFICATION DESIGN REQUIREMENTS FOR US NAVY AIRCRAFT **c05**
Sara J. Ketcham *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 2 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

An important step in the acquisition of a new naval aircraft is the review of detailed specifications by materials and process specialists. The specifications are studied for compliance with SD-24, MIL-F-7179 and MIL-S-5002. In addition, reports on Adhesives, Lubricants, Finishes and Corrosion Control Plans are furnished as a contractural requirement. Some of the most important considerations are the materials to be used, designs incorporating dissimilar metals, and water tightness. Test programs may be necessary to validate a particular choice of material of design. In the final analysis, however, cost and performance are the overriding considerations so some compromises usually have to be made. The challenge is to obtain as corrosion free a vehicle as possible within these constraints. Author

N84-25616# Army Materials and Mechanics Research Center, Watertown, Mass.
CURRENT DESIGN REQUIREMENTS FOR CORROSION CONTROL ON HELICOPTERS **c05**
M. Levy and R. D. French *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Apr. 1984 5 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

Aeronautical Design Standard ADS-13C embodies the general requirements for the materials and processes utilized in the design and construction of Army aircraft. The materials and processes are utilized in accordance with AMCP706-203, the Engineering Design Handbook Helicopter Engineering, part three, Qualification Assurance. The properties of materials are generally obtained from MIL-HDBK-5, MIL-HDBK-17 and MIL-HDBK-23, for metallic materials, plastics, and structural sandwich composites respectively. All of the system parts are finished to provide protection from corrosion and other forms of material deterioration in accordance with a

contractor prepared and Government-approved material deterioration prevention and control (MADPAC) plan which is detailed in the appendix to ADS-13. This appendix describes the managerial and technical responsibilities of Army contractors in the design, validation, development and production phases of Army aviation systems. It provides a mechanism for the implementation of sound materials selection practices and finish treatments during the life cycle of all Army aviation weapon systems and defines the organization and implemenation of a MADPAC finish specification which complies with MIL-F-7179. ADS-13C repesents the most recent revision of the standard which embodies some of the corrosion lessons learned from Army helicopters where weight reduction was the overriding concern in the design and construction of the aircraft. Author

N84-25617# Westland Aircraft Ltd., Yeovil (England).
THE INTERPRETATION OF DESIGN REQUIREMENTS FOR MULTI-MARKET HELICOPTERS **c05**
D. R. Hayward *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 3 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

An approach to corrosion control in helicopters is given. All drawing are vetted before issue to ensure that obvious corrosion sites, sharp edges, and water traps are designed out and of course to obtain the most economical means of protecting components. Wherever possible a coat of pain is applied before assembly. Measures are taken to prevent ingress of water to joints and structures by the use of caulking materials; however, great care is taken to ensure structures are adequately drained. Specific treatments of aluminum, steel, and magnesium are detailed. R.J.F.

N84-25618# Saab-Space A.B., Linkoeping (Sweden). Materials Lab.
CURRENT REQUIREMENTS ON SPECIFICATIONS FOR CORROSION PREVENTION **c05**
Einar Hultgren *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 13 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

The of aluminum, low alloy steel, magnesium, titanium, and composite materials in aircraft construction aimed at corrosion prevention and resistance is discussed. Protective coatings, adhesives and sealants are discussed. The importance of design considerations is explained. R.J.F.

N84-25619# Atlantic Fleet, Norfolk, Va.
US NAVY CORROSION CONTROL MAINTENANCE
G. T. Browne *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 11 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

The U.S. Navy Aircraft Corrosion Prevention/Control Maintenance Program is described. Program elements, present maintenance practice, maintenance control procedures and corrective actions from discovery, resolution and documentation are discussed. A system of checks and balances which are accomplished through a material condition audit program that assesses the quality of information provided for use by mechanics and the ability of the aircraft operator to maintain the aircraft are discussed. The training for personnel involved in the program is also discussed. R.J.F.

N84-25620# Vought Corp., Dallas, Tex. Materials and Processes Dept.
DESIGN AND MANUFACTURING PRACTICES TO MINIMIZE CORROSION IN AIRCRAFT **c05**
A. E. Hohman *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 5 p refs (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

Military weapon systems face tradeoffs of performance, cost of production and maintenance versus long term durability and reduced reliability resulting from corrosion. There is a broad set of requirements presented to contractors which represent the collective wisdom of what is needed for durability. These requirements are judged to be cost effective and near optimum in this tradeoff of performance/cost with corrosion resistance. A few examples of some specific designs, processes and materials which were found by one manufacturer to have significant advantages in this tradeoff by their excellence of protection with minimum tradeoff penalties are discussed. These details of successful experiences are intended to set the stage for two other theses. The first is that the data incorporated in United States Military documents, such as the requirements in MIL-F-7179, Protection of Aerospace Weapon Systems, Mil-Std-1568, Materials and Processes for Corrosion Control, and the materials portions of SD-24, Design and Construction of Weapon Systems, are indeed an excellent base from which we can begin the design of a weapon system. But it is an almost impossible situation to try to spell out the details required to actually obtain performance excellence in the design tradeoffs; or to define the required intricate details necessary to accomplish optimum protection from the pervasive thermodynamics of materials seeking lower free energy states. R.J.F.

N84-25621# National Defence Headquarters, Ottawa (Ontario). Directorate of Aerospace Support Engineering.
CORROSION CONTROL MAINTENANCE PRACTICES FOR CANADIAN AIRCRAFT
R. Simard *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 7 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A09/MF A01

The corrosion control program for aircraft of the Canadian Armed Forces is reviewed. Documentation outlining general guidelines and policy is presented along with excerpts from a manual specific to one particular aircraft. The effects of the operational environment on the extent of the corrosion control program for an aircraft is discussed, with Sea King helicopters and CF-104 aircraft serving as examples. The equipment contained in a corrosion control first aid kit for CF aircraft is highlighted, along with instructions for its use. The training given to CF aviation tradesmen is also outlined. Finally, the protective coating system selected for all CF aircraft is described and its importance to the overall corrosion contol program is noted. R.J.F.

N84-25622# Defence Research Establishment Pacific, Victoria (British Columbia). Materials Engineering Section.
CORROSION RESEARCH IN SUPPORT OF CANADIAN FORCES AIRCRAFT
D. R. Lenard *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 11 p refs (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

Two examples of research projects initiated by the Defense Research Establishment Pacific in direct support of aircraft operators and maintainers in the Canadian Armed Forces are presented. The first example involves a contract research project to investigate the effects of water displacing corrosion inhibiting preparations on the fatigue characteristics of structural joints. The initial experimental plan is outlined and preliminary results are presented. These early results indicated that the preparations did not have a significant effect on the fatigue of single strap, riveted butt joints. The second example concerns the prohibition against use of silicon carbide abrasive papers on aluminum in aircraft. Laboratory investigations including several electrochemical experiments and atmospheric exposure trials clearly demonstrated that the use of silicon carbide abrasive papers did not increase the severity of corrosion. R.J.F.

N84-25623# Naval Air Development Center, Warminster, Pa.
METHODOLOGY FOR ASSESSMENT OF CORROSION COSTS
Irving S. Shaffer *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 7 p ref (For primary document see N84-25613 16-01)

Avail: NTIS HC A05/MF A01

Corrosion has a significant impact on the life cycle costs of naval aircraft. Materials, energy, labor and technical expertise that would otherwise be available for alternative uses must be allocated for corrosion control. To help justify the added expense of designing more corrosion resistance in future Navy aircraft and spending more on corrosion research and technology, valid estimates of the magnitude of corrosion costs and the relative distribution of those costs among various aircraft types and aircraft systems are important. While many factors make up the Navy's cost of corrosion for aircraft ownership, the overwhelming one is the effort spent doing maintenance. The maintenance data collection system is discussed. Tables and graphs showing costs are given. R.J.F.

N84-25624# British Airways, Middlesex (England). Aircraft Engineering (Structures).

COST OF CORROSION FOR COMMERCIAL AVIATION

R. G. Mitchell *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 1 p (For primary document see N84-25613 16-01)

Avail: NTIS HC A05/MF A01

A preliminary analysis of aircraft corrosion costs based on the annual costs of scheduled maintenance, modification, and replacement is discussed. The results show the financial cost of the corrosion problem which can be expressed in several ways. The direct cost per flying hour, depending on operators and aircraft type (not including maintenance overhead) was $8-$12 in 1979 and $8-$20 in 1983. The percentage of direct airframe maintenance cost was between 6% and 8%. The total annual direct cost for International Transport Association member airlines was $100 M based on 1976 operations and $200 M based on 1982 operations. It should be noted that the values represent costs for a range of operators and aircraft types. The lowest value is very conservative and is largely based on one operators actual modification project costs only. The higher value is probably closer to the true cost since it is based upon a breakdown of actual modification, routine maintenance and inspection costs. Closer examination of these figures reveal that the major component in the cost values associated with corrosion prevention and control is due to labor costs. An additional cost not reflected in the above figures is the unscheduled downtime both at main base and route stations. R.J.F.

N84-25625# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

SPECIAL COURSE ON V/STOL AERODYNAMICS

Loughton, England Apr. 1984 383 p refs Course held in Rhode-Saint-Genese, Belgium, 14-18 May 1984, and in Moffett Field, Calif., 4-8 Jun. 1984

(AGARD-R-710; ISBN-92-835-1472-6) Avail: NTIS HC A17/MF A01

The aim of the Special Course on V/STOL Aerodynamics was to outline and discuss the additional knowledge of aerodynamics needed to embark on the design of V/STOL aircraft. The influence of V/STOL features on wing design, layout considerations, engine and air intake considerations, effects of jet effluxes, wind tunnel and flight testing, maneuverability and control, performance assessment and special aspects of flight aerodynamics were discussed. For individual titles, see N84-25626 through N84-25637.

N84-25626# Kingston Polytechnic, Kingston-Upon-Thames (England). School of Mechanical, Aeronautical, and Production Engineering.

INTRODUCTION AND REVIEW OF SOME JET INTERFERENCE PHENOMENA RELEVANT TO V/STOL AIRCRAFT c02

E. C. P. Ransom and J. R. Smy (British Aerospace Aircraft Group, Kingston-upon-Thames, England) *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 23 p refs (For primary document see N84-25625 16-01)

Avail: NTIS HC A17/MF A01

This introductory paper summarizes and discusses aspects of some fluid flows relevant to V/STOL aircraft. The principal sources of reference are the contributions to AGARD conferences which have been specifically concerned with V/STOL aerodynamics. Initially consideration has been given to the behavior of single axisymmetric jets discharging into stationary surroundings and the creation of the corresponding flow field. The effect that a change of fluid properties has on the flow field and plume development is then described and is extended to include jets discharging into a cross flow and into a coflowing stream. The aerodynamics of jets impinging on adjacent surfaces are reviewed with particular reference to induced lift losses generated during hovering in ground effect, to ground erosion and to recirculation. Internal fluid flows in thrust augmentors are described including the effect of losses, and the generation of unsteady flows which are used to enhance mixing rates. The paper concludes with a brief discussion of modelling techniques and wind tunnel methods including interference effects. Author

N84-25627# British Aerospace Aircraft Group, Kingston-upon-Thames (England).

THE INFLUENCE OF V/STOL ON WING DESIGN AND TAILPLANE DESIGN c05

C. L. Bore *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 6 p (For primary document see N84-25625 16-01)

Avail: NTIS HC A17/MF A01

It is shown that one of the most powerful influences upon the payload/range of V/STOL aircraft is exerted by reducing the weight of the wing. The process of designing a lightweight wing involves meticulous effort to achieve exceptionally high maneuvering lift coefficients, combined with due attention to the geometrical and structural interactions. There are constraints all round, such as the need to avoid undue interference with jet effluxes below the wing roots, and the physical constraint of providing fuel volume and space for low drag store carriage. Any structural complexities which threaten to increase wing weight seriously (such as cut-outs, opening panels for fans or ejectors and so on) are inefficiences which should be entertained only for valuable benefits. B.W.

N84-25628*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

V/STOL CONCEPTS IN THE UNITED STATES: PAST, PRESENT, AND FUTURE c05

W. P. Nelms and S. B. Anderson *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 44 p refs Previously announced as N84-22532 (For primary document see N84-25625 16-01)

Avail: NTIS HC A17/MF A01 CSCL 01C

Nonhelicopter types of V/STOL aircraft developed in the United States are reviewed, and some lessons learned from a selected number of concepts are highlighted. The AV-8B, which was developed by modifications to the British Harrier is the only current concept examined. Configurations proposed for the future subsonic, multimissing aircraft and the future supersonic fighter/attack aircraft are described. Emphasis is on these supersonic concepts. B.W.

N84-25629# British Aerospace Aircraft Group, Warton (England). Advanced Projects Dept.

LAYOUT CONSIDERATIONS AND TYPES OF V/STOL AIRCRAFT c05

J. Fletcher *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 36 p ref (For primary document see N84-25625 16-01)

Avail: NTIS HC A17/MF A01

This report summarizes V/STOL aircraft developed in the United States and describes concepts considered for future applications. The discussion is limited to non-helicopter types of vehicles. In particular, past V/STOL aircraft will be reviewed, and some lessons learned from a selected number of concepts will be highlighted. The only current concept described is the AV-8B, which was developed by modifications to the British Harrier. Configurations recently proposed for the future subsonic, multimission aircraft and the future supersonic fighter/attack aircraft will be described. Emphasis in the lecture will be on these supersonic concepts. B.W.

N84-25630# Rolls-Royce Ltd., Bristol (England).
V/STOL PROPULSION SYSTEM AERODYNAMICS **c07**
W. J. Lewis *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 24 p (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01

Different V/STOL propulsion system concepts are briefly described. Highlighted are those features of the systems which present the aerodynamicist with either more severe problems or different problems from those present on conventional takeoff and landing engines. After illustrating some of the demands V/STOL makes on the engine cycle choice and some of the compromises necessary, the individual parts of the propulsion system are considered in turn. Because of the enormous scope of the subject, attention was limited to aspects which are common to a number of the different propulsion systems. Author

N84-25631*# McDonnell Aircraft Co., St. Louis, Mo.
JET FLOWFIELDS **c02**
Donald R. Kotansky *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 48 p refs (For primary document see N84-25625 16-01)
(Contracts NAS2-9646; NAS2-10184; NAS2-11161; N62269-76-C-0086; N62269-81-C-0717; N00014-79-C-0130)
Avail: NTIS HC A17/MF A01 CSCL 01A

The unique aero/fluid mechanics of V/STOL jet flowfields both in and out of ground effect and how they influence and may be accommodated in the aircraft design process are described. Key topics addressed include the following: jet development in static and cross-flow conditions, jet impingement (round jets/rectangular jets including nozzle pressure ratio and temperature effects), multiple jet impingement and fountain upwash formation and development (ground surface flows, stagnation lines, fountain characteristics), fountain impingement on the airframe, jet induced effects on the airframe in and out of ground effect including trim and stability considerations, effects of forward (STOL) and cross-wind velocities, and exhaust gas ingestion (VTOL, STOL). Discussion of the above items will include their influence on vehicle design and system performance and their quantification and prediction via theoretical and empirical predictions, and small and large scale wind tunnel tests. Aero/propulsion devices discussed include V/STOL multiple jet lift systems (low and high pressure ratio) and STOL thrust vectoring/reversing nozzles. R.J.F.

N84-25632*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
V/STOL MANEUVERABILITY AND CONTROL **c08**
James A. Franklin and Seth B. Anderson *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 47 p refs Prevously announced as N84-22584 (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01 CSCL 01C

Maneuverability and control of V/STOL aircraft in powered-life flight is studied with specific considerations of maneuvering in forward flight. A review of maneuverability for representative operational mission tasks is presented and covers takeoff, transition, hover, and landing flight phases. Maneuverability is described in terms of the ability to rotate and translate the aircraft and is specified in terms of angular and translational accelerations imposed on the aircraft. Characteristics of representative configurations are reviewed, including experience from past programs and expectations for future designs. The review of control covers the characteristics inherent in the basic airframe and propulsion system and the behavior associated with control augmentation systems. Demands for augmented stability and control response to meet certain mission operational requirements are discussed. Experience from ground-based simulation and flight experiments that illustrates the impact of augmented stability and control on aircraft design is related by example. Author

N84-25633*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
V/STOL WIND-TUNNEL TESTING **c02**
David G. Koenig *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 71 p refs (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01 CSCL 01A

Factors influencing effective program planning for V/STOL wind-tunnel testing are discussed. The planning sequence itself, which includes a short checklist of considerations that could enhance the value of the tests, is also described. Each of the considerations, choice of wind tunnel, type of model installation, model development and test operations is discussed, and examples of appropriate past and current V/STOL test programs are provided. A short survey of the moderate to large subsonic wind tunnels is followed by a review of several model installations, from dimensional to large-scale models of complete aircraft configurations. Model sizing, power simulation, and planning are treated, including three areas in test operations: data acquisition systems, acoustic measurements in wind tunnels, and flow surveying. Author

N84-25634# British Aerospace Aircraft Group, Kingston-upon-Thames (England).
GROUND BASED TESTING WITHOUT WIND TUNNELS **c05**
C. L. Bore *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 6 p refs (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01

Ground based tests of V/STOL aircraft not requiring wind tunnels are described. Harrier aircraft and the Bristol-Siddeley BS 53 (Pegasus) engine are given particular consideration. Tests of aircraft reaction controls, air intakes, anti-lift (suckdown) forces, and hot gas recirculation (HGR) are discussed. Jet thrust was the critical parameter studied in all of the test schemes. Modifications in aircraft design, such as the use of underfuselage strakes, were addressed. R.S.F.

N84-25635# British Aerospace Public Ltd. Co., Preston (England).
AERODYNAMICS OF V/STOL AIRCRAFT: PERFORMANCE ASSESSMENT **c02**
D. C. Leyland *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 26 p refs (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01

Combat performance assessment of jet-borne V/STOL aircraft of the Harrier/AV8B family is discussed. Performance requirements for vertical takeoff and short takeoff are outlined and reviewed. Parameters considered for vertical operation include: margin for acceleration and maneuver, jet-induced lift losses, hot gas reingestion, and reaction control air bleed. Cruise, vectored thrust, jet lift enhancement, and the accelerating transition maneuver from jet-borne flight to aerodynamic lift are also discussed. R.S.F.

N84-25636*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ASSESSMENT OF AERODYNAMIC PERFORMANCE OF V/STOL AND STOVL FIGHTER AIRCRAFT **c02**
W. P. Nelms *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 35 p refs Previously announced as N84-22536 (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01 CSCL 01C

The aerodynamic performance of V/STOL and STOVL fighter/attack aircraft was assessed. Aerodynamic and propulsion/airframe integration activities are described and small-and large-scale research programs are considered. Uncertainties affecting aerodynamic performance that are associated with special configuration features resulting from the V/STOL requirement are addressed. Example uncertainties related to minimum drag, wave drag, high angle of attack characteristics, and power-induced effects. Engine design configurations from several aircraft manufacturers are reviewed. Author

N84-25637# British Aerospace Aircraft Group, Kingston-upon-Thames (England).
NOTES ON SPECIAL FLIGHT ASPECTS, SUCH AS STO, SKI-JUMP AND ODM **c05**
C. L. Bore *In* AGARD Spec. Course on V/STOL Aerodyn. Apr.

1984 6 p refs (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01

The dimensionless parameters which dominate the performance of jet-lift V/STOL aircraft are reviewed. Thrust ratings, forces extant in partially jet-borne flight, short takeoff, takeoff-weight ratio, ski-jump takeoff, and deck launch are considered. Harrier aircraft and the Bristol-Siddeley BS 53 (Pegasus) engine serve as the paradigms for the discussion. R.S.F.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-25638 Dayton Univ., Ohio.
ACTIVE SUPPRESSION OF AEROELASTIC INSTABILITIES FOR FORWARD SWEPT WINGS Ph.D. Thesis
Thomas E. Noll 1983 127 p Previously announced in IAA as A83-29669
Avail: Univ. Microfilms Order No. DA8404707

The potential of applying active feedback principles for controlling aeroelastic instabilities on a forward swept wing was investigated. Control laws were developed for a cantilever flexible wing and for the wing/fuselage model free in pitch. Design philosophy consisted of using a leading edge surface with displacement feedback to prevent the lower frequency instability of the wing and using a trailing edge surface commanded by angular acceleration feedback to increase the flutter speed of a higher frequency mode involving coupling of 2nd bending and torsion. The blended system successfully controlled the instabilities of both wind configurations up to a significantly higher airspeed. The design provided respectable gain margins. However, phase margins were low and would require tradeoffs with airspeed improvement to obtain more desirable values. E.A.K.

N84-25639*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
AN INVESTIGATION OF AERODYNAMIC CHARACTERISTICS OF WINGS HAVING VORTEX FLOW USING DIFFERENT NUMERICAL CODES Final Report, period ending 31 Mar. 1984
Sushil Chaturvedi and Farhad Ghaffari Apr. 1984 30 p
(Grant NsG-1561)
(NASA-CR-173596; NAS 1.26:173596) Avail: NTIS HC A03/MF A01 CSCL 01A

Three different numerical codes are employed to determine the aerodynamic characteristics of wings with separation induced vortex flows. Both flat as well as cambered wings of various planform shapes are studied. The effects of wing thickness, fuselage, notch ratio and multiple vortex modeling on aerodynamic performance of the wing are also examined. The theoretically predicted results are compared with experimental results to validate the various computer codes used in this study. An analytical procedure for designing aerodynamically effective leading edge extension (LEE) for a thick delta wing is also presented. M.A.C.

N84-25640# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
CALCULATION OF AERODYNAMIC CHARACTERISTICS OF WINGS WITH THICKNESS AND CAMBER BY A NEW METHOD BASED ON THE MODIFIED VORTEX LATTICE METHOD
R. Gordon and J. Rom Jul. 1982 88 p refs Sponsored in part by Army
(Grant AF-AFOSR-0064-80)
(TAE-493) Avail: NTIS HC A05/MF A01

A vortex lattice model for the calculation of the flow over delta shaped wing planforms at high angles of attack in subsonic flow is presented. This model enables the prediction of the aerodynamic coefficients and the pressure distributions for a wide range of wing planforms, in particular for delta shaped wings with and without camber. A method, based on the combination of the vortex lattice and the panel source singularities, is applied to the calculations of aerodynamic characteristics of thick wings having sharp leading edges. The calculated results are in a very good agreement with experimental data. A parametric study of the numerical model and some numerical considerations which enable considerable reduction of the computer time are also discussed. Author

N84-25641*# Bihrle Applied Research, Inc., Jericho, N. Y.
ROTARY BALANCE DATA FOR A TYPICAL SINGLE-ENGINE GENERAL AVIATION DESIGN FOR AN ANGLE-OF-ATTACK RANGE OF 20 TO 90 DEG. 3: INFLUENCE OF CONTROL DEFLECTION ON PREDICTED MODEL D SPIN MODES
John N. Ralston and Billy P. Barnhart Jun. 1984 338 p refs
(Contract NAS1-16205)
(NASA-CR-3248; NAS 1.26:3248) Avail: NTIS HC A15/MF A01 CSCL 01A

The influence of control deflections on the rotational flow aerodynamics and on predicted spin modes is discussed for a 1/6-scale general aviation airplane model. The model was tested for various control settings at both zero and ten degree sideslip angles. Data were measured, using a rotary balance, over an angle-of-attack range of 30 deg to 90 deg, and for clockwise and counter-clockwise rotations covering an omegab/2V range of 0 to 0.5. Author

N84-25642*# Washington Univ., Seattle.
A NUMERICAL STUDY OF THE CONTROLLED FLOW TUNNEL FOR A HIGH LIFT MODEL
Pareshkumar C. Parikh 1984 120 p refs
(Grant NsG-2260)
(NASA-CR-166572; NAS 1.26:166572) Avail: NTIS HC A06/MF A01 CSCL 01A

A controlled flow tunnel employs active control of flow through the walls of the wind tunnel so that the model is in approximately free air conditions during the test. This improves the wind tunnel test environment, enhancing the validity of the experimentally obtained test data. This concept is applied to a three dimensional jet flapped wing with full span jet flap. It is shown that a special treatment is required for the high energy wake associated with this and other V/STOL models. An iterative numerical scheme is developed to describe the working of an actual controlled flow tunnel and comparisons are shown with other available results. It is shown that control need be exerted over only part of the tunnel walls to closely approximate free air flow conditions. It is concluded that such a tunnel is able to produce a nearly interference free test environment even with a high lift model in the tunnel. M.G.

N84-25643# Cranfield Inst. of Tech., Bedfordshire (England). Dept. of Aerodynamics.
FULL SCALE WIND TUNNEL TESTS ON HANG GLIDER PILOTS
E. A. Kilkenny Apr. 1984 66 p refs
(CA-8416) Avail: NTIS HC A04/MF A01

The weight shift control of hang gliders and the position of the pilot makes the aerodynamic characteristics of hang glider pilots an integral part of hang glider stability and performance calculations. Full scale mobile facilities were developed to measure the characteristics of the wings but very little information is available about the pilot. A series of full scale wind tunnel measurements were carried out to investigate the aerodynamic characteristics of hang glider pilots. Five pilots were tested over a range of positions and wind speeds with various types of pilots harnesses. The results are strongly dependent on each pilot and the flying position he adopts. A range of pilot drag figures should be used in stability calculations rather than just one mean value. Author

N84-25644*# National Aeronautics and Space Administration, Washington, D. C.
COLD-AIR PERFORMANCE OF COMPRESSOR-DRIVE TURBINE OF DEPARTMENT OF ENERGY UPGRADED AUTOMOBILE GAS

TURBINE ENGINE. 3: PERFORMANCE OF REDESIGNED TURBINE

Richard J. Roelke and Jeffrey E. Haas Jan. 1984 40 p refs Prepared in cooperation with Army Research and Technology Labs.

(Contract DE-AI01-80CS-50194)

(NASA-TM-83627; E-2044; DOE/NASA/50194-39; NAS 1.15:83627; USAAVSCOM-TR-84-C-7) Avail: NTIS HC A03/MF A01 CSCL 21A

The aerodynamic performance of a redesigned compressor drive turbine of the gas turbine engine is determined in air at nominal inlet conditions of 325 K and 0.8 bar absolute. The turbine is designed with a lower flow factor, higher rotor reaction and a redesigned inlet volute compared to the first turbine. Comparisons between this turbine and the originally designed turbine show about 2.3 percentage points improvement in efficiency at the same rotor tip clearance. Two versions of the same rotor are tested: (1) an as cast rotor, and (2) the same rotor with reduced surface roughness. The effect of reducing surface roughness is about one half percentage point improvement in efficiency. Tests made to determine the effect of Reynolds number on the turbine performance show no effect for the range from 100,000 to 500,000. M.A.C.

N84-25645*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

REYNOLDS NUMBER EFFECTS ON PRESSURE LOSS AND TURBULENCE CHARACTERISTICS OF FOUR TUBE-BUNDLE HEAT EXCHANGERS

William B. Igoe and Carl L. Gentry, Jr. Jun. 1983 28 p refs

(NASA-TM-85807; L-15721; NAS 1.15:85807) Avail: NTIS HC A03/MF A01 CSCL 01A

The aerodynamic characteristics of pressure loss and turbulence on four tube-bundle configurations representing heat-exchanger geometries with nominally the same heat capacity were measured as a function of Reynolds numbers from about 4000 to 400,000 based on tube hydraulic diameter. Two configurations had elliptical tubes, the other two had round tubes, and all four had plate fins. The elliptical-tube configurations had lower pressure loss and turbulence characteristics than the round-tube configurations over the entire Reynolds number range. Author

N84-25646*# Tennessee Univ., Knoxville. Dept. of Mechanical and Aerospace Engineering.

MEASUREMENT OF LOCAL CONNECTIVE HEAT TRANSFER COEFFICIENTS OF FOUR ICE ACCRETION SHAPES Final Report

Mark E. Smith, Rao V. Armilli, and Edward G. Keshock May 1984 97 p refs

(Grant NAG3-83)

(NASA-CR-174680; NAS 1.26:174680) Avail: NTIS HC A05/MF A01 CSCL 20D

In the analytical study of ice accretions that form on aerodynamic surfaces (airfoils, engine inlets, etc.) it is often necessary to be able to calculate convective heat transfer rates. In order to do this, local convective heat transfer coefficients for the ice accretion shapes must be known. In the past, coefficients obtained for circular cylinders were used as an approximation to the actual coefficients since no better information existed. The purpose of this experimental study was to provide local convective heat transfer coefficients for four shapes that represent ice accretions. The shapes were tested with smooth and rough surfaces. The experimental method chosen was the thin-skin heat rate technique. Using this method local Nusselt numbers were determined for the ice shapes. In general it was found that the convective heat transfer was higher in regions where the model's surfaces were convex and lower in regions where the model's surfaces were concave. The effect of roughness was to increase the heat transfer in the high heat transfer regions by approximately 100% while little change was apparent in the low heat transfer regions. Author

N84-25647*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

APPLICATION OF A QUASI-3D INVISCID FLOW AND BOUNDARY LAYER ANALYSIS TO THE HUB-SHROUD CONTOURING OF A RADIAL TURBINE

Kestutis C. Civinskas and Louis A. Povinelli 1984 21 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984; sponsored by the AIAA, SAE and ASME

(DA Proj. 1L1-61102-AH-45)

(NASA-TM-83669; E-2112; NAS 1.15:83669; USAAVSCOM-TR-84-C-1; AIAA-84-1297) Avail: NTIS HC A02/MF A01 CSCL 21E

Application of a quasi-3D approach to the aerodynamic analysis of several radial turbine configurations is described. The objective was to improve the rotor aerodynamic characteristics by hub-shroud contouring. The approach relies on available 2D inviscid methods coupled with boundary layer analysis to calculate profile, mixing, and endwall losses. Windage, tip clearance, incidence, and secondary flow losses are estimated from correlations. To eliminate separation along the hub and blade suction surfaces of a baseline rotor, the analysis was also applied to three alternate hub-shroud geometries. Emphasis was on elimination an inducer velocity overshoot as well as increasing hub velocities. While separation was never eliminated, the extent of the separated area was progressively reduced. Results are presented in terms of mid-channel and blade surface velocities; kinetic energy loss coefficients; and efficiency. The calculation demonstrates a first step for a systematic approach to radial turbine design that can be used to identify and control aerodynamic characteristics that ultimately determine heat transfer and component life. Experimentation will be required to assess the extent to which flow and boundary layer behavior were predicted correctly. M.G.

N84-25648*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

NONLINEAR PROBLEMS IN FLIGHT DYNAMICS

Gary T. Chapman and Murray Tobak May 1984 79 p refs Presented at the Berkeley-Ames Conf. on Nonlinear Probl. in Control and Fluid Dyn., Berkeley, Calif., 31 May - 10 Jun. 1983

(NASA-TM-85940; A-9707; NAS 1.15:85940) Avail: NTIS HC A05/MF A01 CSCL 01A

A comprehensive framework is proposed for the description and analysis of nonlinear problems in flight dynamics. Emphasis is placed on the aerodynamic component as the major source of nonlinearities in the flight dynamic system. Four aerodynamic flows are examined to illustrate the richness and regularity of the flow structures and the nature of the flow structures and the nature of the resulting nonlinear aerodynamic forces and moments. A framework to facilitate the study of the aerodynamic system is proposed having parallel observational and mathematical components. The observational component, structure is described in the language of topology. Changes in flow structure are described via bifurcation theory. Chaos or turbulence is related to the analogous chaotic behavior of nonlinear dynamical systems characterized by the existence of strange attractors having fractal dimensionality. Scales of the flow are considered in the light of ideas from group theory. Several one and two degree of freedom dynamical systems with various mathematical models of the nonlinear aerodynamic forces and moments are examined to illustrate the resulting types of dynamical behavior. The mathematical ideas that proved useful in the description of fluid flows are shown to be similarly useful in the description of flight dynamic behavior. M.G.

N84-25649# National Aerospace Lab., Tokyo (Japan).

DOUBLET POINT METHOD FOR CALCULATIONS ON OSCILLATORY LIFTING SURFACES. PART 2: SUPERSONIC FLOW

Tetsuhiko Ueda 1983 15 p refs

(NAL-TR-785-Pt-2; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

A method to predict unsteady aerodynamic forces on lifting surfaces in supersonic flow is presented. The wing is divided into small segments in which the lift force is expressed by a single point doublet of the acceleration potential. This is the same concept as the doublet point method developed by the authors for subsonic

flows. In order to avoid sensitiveness to the Mach number, the upwash due to the point doublet is calculated by averaging over small areas. The integration is done analytically so that it requires no numerical quadrature. Pressure distributions are directly obtained as the unknowns of an algebraic equation. The results are compared with those obtained by other methods for various wing geometries including the AGARD Wing-tail configuration. Author

N84-25650# National Aerospace Lab., Tokyo (Japan).
WIND TUNNEL INVESTIGATION OF THE ROLLING MOMENT OF A RECTANGULAR WIND WITH SOME WINGLETS ON THE LEFT UPPER TIP
Akihito Iwasaki, Naoto Takizawa, and Nagakatsu Kawahata Nov. 1983 29 p refs In JAPANESE; ENGLISH summary
(NAL-TR-788; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Wind tunnel tests were conducted to investigate the increment of rolling moment due to a winglet mounted on the left upper tip of a rectangular wing of aspect ratio of 5.2 with a NACA 0012 section. Two planforms of winglets, rectangular and swept back forms, were tested. Both winglets are equipped with plain flaps to control their side forces. The winglets were canted outboard 90 deg or 75 deg dihedral and toed in or out up to 20 deg relative to the wind chord. The flaps of the winglets were also deflected up to + or - 30 deg. The low speed (Reynold's number based on wing chord 5 x 10 to the 5th power) data were obtained over angles of attack of approximately + or - 15 deg and at the angles of sideslip of 0 deg and + or - 10 deg. The results indicated that a single winglet produce a relatively large rolling moment with side force, but when left upper and right lower winglets were combined at a time the two rolling moments cancelled each other out. It was also found that the incremental rolling moment by a single winglet of 75 deg dihedral is about 40% larger than that of 90 deg dihedral. B.W.

N84-25651# National Aerospace Lab., Tokyo (Japan).
AERODYNAMIC CHARACTERISTICS OF FAN-JET STOL AIRCRAFT
Norio Inumaru, Hitoshi Takahashi, Kenichi Hirosue, Nobuhiro Toda, and Naoaki Kuwano 1983 102 p refs In JAPANESE; In JAPANESE; ENGLISH summary
(NAL-TR-790; ISSN-0389-4010) Avail: NTIS HC A06/MF A01

Research on Fan-Jet STOL aircraft was initiated by NAL in 1975 as a wind-tunnel-based program aimed at the design study of experimental STOL aircraft. Aerodynamic characteristics of the Augmentor Wing type model and the Upper Surface Blowing type models are examined by a series of wind-tunnel tests. Three-component longitudinal data of each model are presented. Six-component lateral data cf a USB type model are also presented with four engines operating and with one engine out. The general aerodynamic trends of Powered-Lift systems are discussed through comparison with existing data. Discussions concerning the test-techniques are also included. The research was concluded in 1979, making direct contributions to the basic design of NAL Quiet STOL Experimental Aircraft. Author

N84-25652# European Space Agency, Paris (France).
WIND TUNNEL INVESTIGATIONS ON THIN SUPERCRITICAL AIRFOILS IN THE HIGH SUBSONIC FLOW REGIME
Horst Koerner and Wolfgang Puffert-Meissner May 1983 65 p refs Transl. into ENGLISH of "Windkanaluntersuchungen an duennen superkritischen profilen im hohen unterschall" rept. DFVLR-FB-82-06 DFVLR, Brunswick, Feb. 1982
(ESA-TT-774; DFVLR-FB-82-06) Avail: NTIS HC A04/MF A01; Original German report available from DFVLR, Cologne DM 19,30

This report deals with experimental investigations on four thin airfoils (d/1 = 0.05 - see list of symbols), three supercritical airfoils being compared with a conventional one with reference to aerodynamic efficiency. The investigations, conducted in the DFVLR's Brunswick transonic wind tunnel, at Mach numbers ranging from 0.6 to 0.95 and at a Reynolds number 4.10 to the 6th power (6.10 to the 6th power) show the superiority of supercritical airfoil design. This is demonstrated in terms of overall coefficients, efficiency limits and, in particular cases, pressure distributions. Author

N84-25653# European Space Agency, Paris (France).
EVALUATION OF BOUNDARY LAYER MEASUREMENTS IN TWO-DIMENSIONAL COMPRESSIBLE SUBSONIC FLOW WITH A PRESSURE GRADIENT ACROSS THE BOUNDARY LAYER
Reinhard Kiock Jul. 1983 25 p refs Transl. into ENGLISH of "Auswertung von grenzschichtmessungen in zweidimensionaler kompressibler unterschallstroemung mit druckgradient in der grenzschicht" rept. DFVLR-Mitt-82-14 DFVLR, Brunswick, Jun. 1982 Original language document announced as N83-20919
(ESA-TT-810; DFVLR-Mitt-82-14) Avail: NTIS HC A02/MF A01; original German report available from DFVLR, Cologne DM 12,70

When the flow along a highly curved wall decelerates, thick boundary layers arise which have a large normal gradient of the static pressure. This pressure gradient affects the way in which the boundary layer measurements are interpreted, i.e., the determination of the displacement thickness, the momentum thickness and the shape factor. These parameters are defined in a variety of ways, and the results are compared for an arbitrarily defined example case. Author

N84-25654# European Space Agency, Paris (France).
THE GENERATION OF HIGHER LEVELS OF TURBULENCE IN THE TEST SECTION OF THE HIGH SPEED CASCADE WIND TUNNEL AT BRUNSWICK FOR SIMULATION OF TURBO-MACHINERY CONDITIONS
Reinhard Kiock, Gerhard Laskowski, and Heinz Hoheisel Jul. 1983 52 p refs Transl. into ENGLISH of "Die erzeugung hoeherer turbulenzgrade in der messstreckl des hochgeschwindigkeits-gitterwindkanals, Braunschweig, zur simulation turbomaschinenaehnlicher bedingungen" rept. DFVLR-FB-82-25 DFVLR, Brunswick, Mar. 1982
(ESA-TT-815; DFVLR-FB-82-25) Avail: NTIS HC A04/MF A01; original German report available from DFVLR, Cologne DM 19,50

The flow through a turbomachine is characterized by strong turbulence. Periodic velocity changes are superposed by stochastic velocity fluctuations, and the degree of turbulence achieves values up to 20%. Similar turbulence should be simulated at the investigation of cascades in the wind tunnel. For this purpose, turbulence was generated by grids of crossed bars in a high speed cascade wind tunnel. Now a turbine cascade can be investigated at its design point with a degree of turbulence of Tu sub 1 0.8%, 3.1%, 5.6%, and 7.9% defined in the cascade inlet plane. Considerably higher values are achieved only in the case of increasing inhomogeneous distribution of dynamic head and turbulence across the test section. Author

N84-25655# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.
EXPERIMENTAL MODAL ANALYSIS
Trouve and Chabassieu 1983 8 p Presented at the AAAF 8th European Rotorcraft and Powered Lift Aircraft Forum, Aix-en-Provence, France, 31 Aug. - 3 Sep. 1982
(SNIAS-832-210-110) Avail: NTIS HC A02/MF A01

The development of an experimental software program that analyzes the dynamic behavior of structural vibration is examined. Helicopter rotor vibrations are analyzed for shape animation, damping methods, and general model refinement. M.A.C.

N84-25656# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
HYPERSONIC AEROTHERMODYNAMICS
1984 587 p refs Lecture Ser. held at Rhode-Saint-Genese, Belgium, 6-10 Feb. 1984
(VKI-LS-1984-01; D/1984/0238/293) Avail: NTIS HC A25/MF A01

The fundamentals of hypersonic flow are reviewed. Following a review of hypersonic flow theory and a summary of facility and computational requirements, two important aspects of hypersonic vehicle design were stressed: stability and heat transfer. Much valuable information on lifting reentry was recently made available

from an analysis of the performance of the US space shuttle; comparison of the flight test results with predictions and a summary of those areas of hypersonics requiring greater understanding are presented. A thorough examination of one possible candidate configuration for lifting reentry and tactical missiles, the waverider concept, was made, emphasizing the trade-offs necessary for a successful design. For individual titles, see N84-25657 through N84-25667.

N84-25657# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Directorate of Space Transportation Systems.
THE ESA ACTIVITIES ON FUTURE LAUNCHERS c15
H. Pfeffer *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1984 23 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01

A future launcher development scenario depends on many assumptions, such as the impetus provided by the probability of future missions, and the political willingness of member states to undertake future developments. Because of the long timescale implied by a coherent launcher development, a step-wise approach within an overall future launcher development plan appears essential. The definition of development steps allows the launcher developments to be adapted to the driving external forces, so that no possible opportunity to Europe in the space launch business is missed out because of improper planning on the absence of a long term goal. The launcher senario, to be presented in 1985, forms part of Europe's overall STS plan for the future. This overall STS plan is one product of the complete STS LTPP, a first draft of which should exist by 1985, and which will be updated regularly to take into account the changing political and economic perspectives. Author

N84-25658*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE NEXT GENERATION OF REENTRY VEHICLES: NASA'S VIEW c18
Gerald D. Walberg *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1984 95 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01 CSCL 22B

The term reentry vehicle is used in the broad sense. The vehicles addressed include not only those that return from orbit to the Earth's surface, but also aeroassisted orbit transfer vehicles that use aerodynamic forces generated during atmospheric passes to achieve orbital changes with a smaller expenditure of energy than is required for an all-propulsion vehicle. Advanced reusable launch vehicles with special emphasis on system concepts and the influence of advanced technology on entry vehicle configuration are considered. Three categories of orbital transfer vehicles discussed: synergetic plane-change vehicles, planetary aerocapture vehicles, and LEO to GEO orbital transfer vehicles. While the orbital transfer and planetary vehicles are quite different from conventional winged Earth entry vehicles, synergetic plane change and high cross-range Earth entry vehicles have many similarities. Finally, a possible scenario for the development of the next generation of reentry vehicles is presented. Author

N84-25659*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SHUTTLE FLIGHT DATA ANALYSIS c16
Gerald D. Walberg *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1984 67 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01 CSCL 22B

As the STS moves into routine operations, the direction of the work is shifting to an in-depth assessment of performance and its impact on the design and development of a future generation of vehicles. Particular emphasis is placed on providing an accurate physical explanation of anomalies, assessing the quality of simulation provided by the ground test facilities utilized, understanding the ground to flight extrapolation procedures, and the limitations of theoretical prediction techniques. The results are expected to provide direction and focus for future research and technology programs to enable substantial technological improvements in the next generation vehicles. The recent approval of the Orbital Experiments (OEX) Program's Shuttle Infrared Leeside Temperature Sensing (SILTS), Shuttle Entry Air Data System (SEADS), and Shuttle Upper Atmospheric Mass Spectrometer (SUMS) experiments to be integrated for flight on OV-102 in late 1985 is a firm indication of a strong commitment to a continuing and vigorous program in shuttle flight data analysis. Author

N84-25660# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
FUNDAMENTALS OF HYPERSONICS: AERODYNAMICS AND HEAT TRANSFER
G. Koppenwallner *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1984 61 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01

A survey on fundamental aspects of hypersonic flow is given. The reentry flight problem is analyzed. Hypersonic inviscid and viscous flow is treated and the special features like Mach number independence or viscous interaction are explained. The relevance of these various hypersonic features to vehicle performance data is illustrated by experimental wind tunnel data. Author

N84-25661# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
HYPERSONIC TEST FACILITIES
J. F. Wendt *In its* Hypersonic Aerothermodyn. 1984 29 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01

Hypersonic vehicle design continues to require extensive wind tunnel testing; the correct simulation of the flight conditions in a laboratory environment remains a considerable challenge. A brief review of the wind tunnel requirements, the present status of facilities designed to meet these requirements, and the need for further facility developments are provided. Author

N84-25662# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
THE MEASUREMENT OF HEAT TRANSFER AND TEMPERATURE DISTRIBUTIONS IN HYPERSONIC TESTING
H. Schoeler *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1983 35 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01

Heat transfer measurements are essential for the design of hypersonic flight vehicles. Aerodynamic heating problems also arise with fast attacking missiles or with anti-tank gunnery. The measurement of surface temperature distribution with encapsulated cholesteric liquid crystals is a very simple and easy method for qualitative heat transfer measurement with excellent spatial resolution. The availability of digital image processing systems is increasingly valuable for all thermal mapping techniques. B.G.

N84-25663# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
HYPERSONIC STATIC AND DYNAMIC STABILITY. PART 1: EQUATIONS OF MOTION AND FLIGHT DYNAMICS
R. A. East *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1984 24 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01

The problem of the stability of a vehicle flying in the Earth's atmosphere at hypersonic Mach numbers is examined. The problem of static stability concerns the forces and moments acting on the vehicle when it is perturbed from a steady state motion. If the forces and moments arising from the disturbance are in a sense to restore the vehicle to its original state, then the vehicle is said to be statistically stable. Newtonian mechanics are used to relate the forces acting on the body to the motion. The principal external force fields are gravitational and aerodynamic, although, in certain

problems, buoyancy, and at high altitudes, solar radiation and magnetic forces are present. In low altitude and relatively low speed flight the gravitational force is considered as a constant vector in an inertial frame. However, for high speed, high altitude flight, rotation associated with the Earth's curvature, and with the gravitational inverse square law, are significant. Author

N84-25664# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
HYPERSONIC STATIC AND DYNAMIC STABILITY. PART 2: INVISCID PREDICTION METHODS FOR UNSTEADY HYPERSONIC FLOW
R. A. East *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1984 33 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01

Inviscid methods for evaluating the stability derivatives of two dimensional and axi-symmetric shapes in hypersonic flow are surveyed. Some methods, applicable to pointed body shapes, are exact and are valid over a range of supersonic and hypersonic Mach numbers. Other methods are approximate, but result in closed form analytic expression for the derivatives. Newtonian, Newton-Busemann and embedded Newtonian methods are presented and their relationships to the M (sub infinite) yields infinite, gamma yields 1 limit of gas dynamic theories discussed. Also included are methods suitable for evaluating the stability characteristics of pitching delta and caret wings. Author

N84-25665# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
HYPERSONIC STATIC AND DYNAMIC STABILITY. PART 3: EXPERIMENTAL TECHNIQUES, EXPERIMENTAL RESULTS AND VISCOUS EFFECTS
R. A. East *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1983 50 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01

Experimental techniques, suitable for obtaining dynamic data from both small and large amplitude oscillatory experiments in hypersonic flow facilities, are briefly reviewed. Methods of data acquisition and reduction are considered, and the problem of support interference discussed. Examples of experimental results which highlight the predominantly inviscid effects of body geometry on aerodynamic pitching derivatives are presented. Contrasting results, which demonstrate the effects of boundary layer transition and flow separation on the derivatives, are included, and their relationship with the results of prediction methods discussed. Author

N84-25666# Liege Univ. (Belgium).
COMPUTATIONAL TECHNIQUES FOR HYPERSONIC FLOWS
J.-A. Essers *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1984 60 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01

A survey of modern computational techniques for the numerical simulation of inviscid and viscous compressible flows was presented. Only methods which could be used in the construction of computer codes used for the design of hypersonic vehicles. General time and space marching techniques for the solution of perfect gas flows governed by Euler, boundary layers and full Navier-Stokes equations were discussed. Their generalization to equilibrium real gases would not introduce basic difficulties. Because of the speed and memory limitations of presently existing computers, the Reynolds averaged Navier-Stokes equations were not solved with a sufficient accuracy for very complex geometries. For this reason, new CFD research topics that could overcove these limitations such as adaptive grids and multi-domain approaches (including viscous-inviscid intersections) were presented. Author

N84-25667# Advanced Propulsion and Energy Control Systems Ltd., Hauts (England).
GENERAL INTRODUCTION. PART 1: THE WAVERIDER. ORIGINS, EVOLUTION AND APPLICATIONS. PART 2: WAVE-RIDER AERO-AND AEROTHERMODYNAMICS. PART 3: CONFIGURATION DESIGN. REENTRY GLIDERS. PART 4: CONFIGURATION DESIGN. CRUISE/RAMJET VEHICLES
L. H. Townend *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1984 111 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01

At a time when much of hypersonic wing design was attempted by performing perturbations of slender body theory, the application of Newtonian methods, or the methodical testing of many parameters in a relatively small number of wind tunnels (frequently at too low a Reynolds number to avoid great difficulties in interpretation) the known flow approach injected a simplicity which, to many theoretical and experimental research workers, came as a welcome relief - but to the design engineer, the concept of aircraft and missile configurations having entirely concave undersides and pronounced anhedral on both lower and upper wing skins presented at least as many new problems as were eased at the more fundamental levels. The application of Newtonian methods to lifting reentry; cruise and post reentry glide; aerothermodynamics; heat transfer; configuration design; and cruise/ramjet vehicles is discussed. B.G.

N84-25668# Royal Aircraft Establishment, Farnborough (England).
EXPERIMENTAL PRESSURE DISTRIBUTIONS ON AXISYMMETRIC FOREBODIES AT MACH 3 AND ANGLES OF ATTACK UP TO 17.5 DEGREES
L. C. Ward Nov. 1983 28 p
(AD-A140321; RAE-TM-AERO-1985; DRIC-BR-90954) Avail: NTIS HC A03/MF A01 CSCL 20/4

Tabulations of experimental surface pressure distributions on both blunt and sharp axisymmetric forebodies are presented for a freestream Mach number of 3.0 and body angles of attack up to 17.5 degrees. The experimental details are described, but no analysis of the resultant data has been undertaken. Author (GRA)

N84-25669# Princeton Univ., N. J.
PANEL METHOD FOR PERTURBATIONS OF TRANSONIC FLOWS WITH FINITE SHOCKS Ph.D. Thesis
William David Cockey 1984 629 p
Avail: Univ. Microfilms Order No. DA8405106

An approximate panel method for both steady and unsteady perturbations of two dimensional airfoils in transonic flows is developed. The emphasis is divided between the derivation of the governing equations, formulation of the approximate integral equations, and development of the numerical solution schemes. Starting with the full potential equations, the consistent subsonic, supersonic and transonic linear small disturbance equations are derived. The frequency of the motion is taken into account in both deriving the equations and estimating their range of validity. Corresponding integral equations involving only boundary values are formulated using the method of Green's functions. Since it is not possible to obtain the exact Green's function for the transonic perturbation equation, an approximate Green's function is determined using a local approximation of the variable coefficients. Three generalized spline polynomial panel collocation schemes are developed and compared extensively. Dissert. Abstr.

N84-25670# George Washington Univ., Washington, D.C.
THE COMPRESSIBLE AERODYNAMICS OF ROTATING BLADES USING AN ACOUSTIC FORMULATION Ph.D. Thesis
Lyle Norman Long 1983 126 p
Avail: Univ. Microfilms Order No. DA8324481

This work develops a theoretical formulation for the pressure on the surface of an arbitrary body moving subsonically through a compressible fluid. It also describes a method for solving the resulting integral equation numerically. Important applications exist in the areas of propeller, helicopter, and wing theory. Farassat's integral representation of the linearized conservation of mass and momentum equations describes the pressure due to an arbitrary body in motion. This has been very useful in calculating noise due to propellers and helicopters. As is typical of integral solutions

formulated using a Green's function, the solution developed by Farassat is only valid on the surface in the limit as the observer goes to the surface. The present paper performs this limiting process and thus derives the governing equation for the surface pressure. This analysis is nontrivial because the integral is over a surface in three dimensional space and time. Dissert. Abstr.

N84-25671# Minnesota Univ., Minneapolis.
A THEORETICAL ANALYSIS OF THE AERODYNAMIC AND STRUCTURAL FORCES ASSOCIATED WITH A RIBBON PARACHUTE CANOPY IN STEADY DESCENT Ph.D. Thesis
Kenneth Kenichiro Muramoto 1983 314 p
Avail: Univ. Microfilms Order No. DA8404210

A computational procedure for predicting the performance of a ribbon parachute canopy in steady descent is presented. The structural integrity of the canopy is established through the finite element code CANO 2. The efficiency of CANO 2 has been improved by implementing a Newton-Raphson procedure in the bulge half angle calculation. This scheme not only reduces the computational time but also results in convergence for cases in which the earlier version does not converge. Numerical results obtained from this improved version are presented and compared with existing experimental data. Although there is a considerable variation in the magnitudes of the calculated and measured local distributions, the general trends predicted by CANO 2 are consistent with the experimental results. The theoretical framework needed for optimal canopy design is provided by the coupling of the CANO 2 structural code with an inviscid flow field analysis. The aerodynamic problem is analyzed by treating the parachute as a finite sized porous screen placed in an approaching uniform flow. Dissert. Abstr.

N84-25626# Kingston Polytechnic, Kingston-Upon-Thames (England). School of Mechanical, Aeronautical, and Production Engineering.
INTRODUCTION AND REVIEW OF SOME JET INTERFERENCE PHENOMENA RELEVANT TO V/STOL AIRCRAFT
E. C. P. Ransom and J. R. Smy (British Aerospace Aircraft Group, Kingston-upon-Thames, England) *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 23 p refs (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01

N84-25631*# McDonnell Aircraft Co., St. Louis, Mo.
JET FLOWFIELDS
Donald R. Kotansky *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 48 p refs (For primary document see N84-25625 16-01)
(Contracts NAS2-9646; NAS2-10184; NAS2-11161; N62269-76-C-0086; N62269-81-C-0717; N00014-79-C-0130)
Avail: NTIS HC A17/MF A01 CSCL 01A

N84-25633*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
V/STOL WIND-TUNNEL TESTING
David G. Koenig *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 71 p refs (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01 CSCL 01A

N84-25635# British Aerospace Public Ltd. Co., Preston (England).
AERODYNAMICS OF V/STOL AIRCRAFT: PERFORMANCE ASSESSMENT
D. C. Leyland *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 26 p refs (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01

N84-25636*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ASSESSMENT OF AERODYNAMIC PERFORMANCE OF V/STOL AND STOVL FIGHTER AIRCRAFT
W. P. Nelms *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 35 p refs Previously announced as N84-22536 (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01 CSCL 01C

N84-25987# National Aerospace Lab., Amsterdam (Netherlands).
NUMERICAL COMPUTATION OF VORTICAL FLOWS ABOUT WINGS
H. W. M. Hoeijmakers *In* Von Karman Inst. for Fluid Dynamics Computational Fluid Dyn., Vol. 2 1984 142 p refs (For primary document see N84-25986 16-34)
Avail: NTIS HC A17/MF A01

N84-26435 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
VORTEX FLAP SYSTEM FOR THIN WINGS [VORDERKANTEN-KLAPPENSYSTEME FUER SCHLANKT FLUEGEL: VORTEX FLAPS]
W. Staudacher *In its* Tech. and Sci. Publ. 1983 1983 p 61-84 refs In GERMAN Presented at DGLR Symp.: Leistungssteigerungen bei Flaechenflugzeugen, Frankfurt, 11-12 Nov. 1982 (For primary document see N84-26430 16-81)
(MBB-FE-122/S/Pub/102) Avail: Issuing Activity

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N84-25672# National Transportation Safety Board, Washington, D. C. Bureau of Safety Programs.
ANNUAL REVIEW OF AIRCRAFT ACCIDENT DATA: US GENERAL AVIATION, 1980
12 Apr. 1984 152 p refs
(PB84-182914; NTS/ARG-84/01) Avail: NTIS HC A07/MF A01 CSCL 01C

The record of general aviation accidents for calendar year 1980 is given. Statistics which describe the 3,597 general aviation accidents which occurred in 1980 are given. Eight sections report on subsets of the accidents defined by the type of aircraft involved. Six sections contain statistics on subsets defined by the kind of flying involved (e.g., personal, business, instruction). R.J.F.

N84-25673# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATIONS A-84-1 THROUGH -3
6 Jan. 1984 2 p
Avail: NTIS HC A02/MF A01

A Bellanca Model crashed after the right wing separated in flight; both occupants were killed. Extensive deterioration (wood decay) of the inboard lower portion of the airplane's right wing front spar was noted. Normally, wing strap fittings are bolted to the wood spar, however, because of the decay, this portion of the spar was disconnected from the wing straps. The straps themselves, with the wing through bolts in place, remained attached to the fuselage. The bolts were corroded. A similar accident was also caused by undetected wing spar deterioration and prompted the Federal Aviation Administration (FAA) to issue an airworthiness directive requiring compliance with a Bellanca service letter. The decay was obscured visually because it was behind the wing straps and was covered by the straps and the spar's forward face plate. Additionally, since the wing strap to fuselage attaching bolt is located in this area, a probe inspection of the lower root end of the spar cannot be performed. In order to provide for an immediate, reliable inspection of the wing structure, required remedial actions should include measures beyond the scope of previous directives such as wing removal/disassembly and/or removal of lower wing straps and bolts. M.A.C.

N84-25674# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION A-84-7

21 Feb. 1984 2 p
Avail: NTIS HC A02/MF A01

A Grumman G 159 Gulfstream I was operating as an all cargo flight. At about 4000 feet altitude above ground level, an inflight fire occurred in the area of the right engine and engine cowl. The flightcrew secured the engine and discharged both fire extinguishers. The crew declared an emergency and returned the airplane to the airport without further incident. The inflight fire was caused by a failure of the No. 5 combustion chamber flame tube suspension pin, which allowed a flame breakout through the No.5 combustion chamber. Following several flame breakout incidents, the engine manufacturer issued a Service Bulletin. The Federal Aviation Administration (FAA) responded by issuing an airworthiness directive. M.A.C.

N84-25675# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATIONS A-84-8 AND -9, AND A-84-17 THROUGH -20
29 Mar. 1984 6 p refs
Avail: NTIS HC A02/MF A01

A Lockheed L-1011 airplane, was en route from Miami, Florida, to Nassau, Grand Bahama Island, when the flightcrew noted an indication of loss of oil pressure on the No. 2 engine and shut it down. The captain decided to return to Miami because of better weather and terminal approach aids there. However, after the airplane's course was reversed, the No. 3 engine flamed out; about 5 minutes later, the No. 1 engine flamed out. The flightcrew considered it probable that they would be forced to ditch the airplane and the flight engineer told the senior flight attendant to prepare the cabin for imminent ditching. The flightcrew succeeded in restarting the No. 2 engine, and subsequently landed the airplane safely in Miami. The O ring seals were missing from the master chip detector on each of the airplane's three engines, and that the lack of seals permitted the lubricating oil to leak from each of the engines. The Nos. 1 and 3 engines stopped operating because of damage to the internal gearboxes which interrupted operation of the fuel pumps. M.A.C.

N84-25676# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION(S) A-84-10 AND -11
Jim Burnett 8 Feb. 1984 2 p
Avail: NTIS HC A02/MF A01

About 17 minutes after takeoff on February 2, 1981, a Piper PA-28R-210, N4542Q, crashed near the Houghton County Airport in Michigan. The pilot and two of the passengers were seriously injured. One other passenger received minor injuries and the plane was destroyed. The investigation showed that engine stoppage during flight was the consequence of oil starvation. The front crankcase oil seal was displaced outward and the crankcase breather line contained several of 1/2 inch-diameter pieces of ice. The engine was not equipped with any winterization devices to prevent ice from blocking the crankcase breather line. From January 1, 1977 to September 30, 1983, there were five recorded entries of frozen crankcase breather lines on Piper model PA-28 airplanes recommended that operators of such aircraft be advised of the hazard of operating high-time engines in very cold weather conditions without winterization kits on crankcase breather lines and the design of these line installations be evaluated to determine the need to provide icing protection, and that retrofitting be initiated if necessary. A.R.H.

N84-25677# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATIONS A-84-12 AND -13
8 Feb. 1984 3 p
Avail: NTIS HC A02/MF A01

A series of safety recommendations pertaining to airplane passenger evacuation systems is described. These recommendations are presented to the FAA; (1) to develop a test project for fabrics used in passenger evacuation devices in order to establish certification standards for fire resistant fabrics for these devices, (2) to issue a Technical Standard Order (TSO) prescribing use of fire resistant fabrics, and (3) to take appropriate action to require that all passenger evacuation devices on air carrier airplanes, including those already in service, meet improved fire resistance standards. M.A.C.

N84-25678# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATIONS A-84-14 AND -15
14 Mar. 1984 4 p refs
Avail: NTIS HC A02/MF A01

A DHC 6, crashed during its final landing approach. Of the eight persons aboard the airplane, seven received serious injuries and the other received minor injuries. The airplane was destroyed. Pitch control of the airplane was lost because an elevator control linkage separated. An improper and unsecured bolt was used in the linkage connection, and the bolt had backed out of the linkage. Further investigation into the origin of the improper bolt and the maintenance performed on the airplane disclosed deficiencies in maintenance and inspection organization and procedures. M.A.C.

N84-25679# National Transportation Safety Board, Washington, D. C.
SAFETY RECOMMENDATION(S) A-84-16
Jim Burnett 9 Mar. 1984 3 p ref
Avail: NTIS HC A02/MF A01

On July 23, 1982, at 0220 Pacific daylight time, a Bell UH-1B helicopter, N87701, crashed during the filming of a movie in Valencia, California. The helicopter hovered about 25 ft above a motion picture set showing a typical Vietnam village under attack from heavy ordinance. As the pilot turned to facilitate camera coverage, the tail section was engulfed in a fireball created by the detonation of special effects explosives. The tail rotor assembly separated and the helicopter descended out of control. The main rotor blade fatally injured three actors on the ground. Six occupants on the aircraft sustained minor injuries and the aircraft was damaged substantially. The facts, conditions, and circumstances of this accident amply demonstrate the need for a requirement that helicopter operators prepare a manual and carry out its provisions as a prerequisite for the use of a helicopter in movie and television film production. The manual should contain provisions for pilot qualification, mandatory briefings of film production personnel on the risks involved, safeguards needed during operations, a plan for communications among all participating personnel, and a provision confirming the pilot-in-command's ultimate authority to control all flight regimes relative to this type of operation. A.R.H.

N84-25680# National Transportation Safety Board, Washington, D. C.
[SAFETY RECOMMENDATION: CESSNA MODEL 402C AIRPLANE, SEPTEMBER 5, 1983, TAMPA INTERNATIONAL AIRPORT, TAMPA, FLORIDA]
1 Feb. 1984 2 p
Avail: NTIS HC A02/MF A01

On September 5, 1983, a Cessna Model 402C airplane, N29PB, was involved in an accident at the Tampa International Airport, Tampa, Florida. Upon touchdown, the nose landing gear collapsed as a result of a fatigue failure of the bearing (part No. MS-21242S-4K) in the rod end of the hydraulic actuator. Similarly caused accidents in the Cessna Model 400 series occurred elsewhere. Until recently, the bearings installed in the actuator rod end were produced for Cessna by several vendors. The original specifications and standards for their design and manufacture were those contained in Military Standard MS-21242. On January 31, 1978, they were superseded by those in Military Specification MIL-B-81935. Investigations of the accidents at Tampa and Gainesville disclosed that the bearings did not conform to either. The slope of each of the respective bearing housings, measured relative to the bearing's longitudinal axis, exceeded the maximum specified angle of 35. This resulted in a reduction in the size and strength of the bearing housings which, the Safety Board concluded, contributed to the structural fatigue of these parts. Recommenda-

tions to the Federal Aviation Administration on performance testing, engineering analysis, and the issuance of directives are given.
R.J.F.

N84-25681# National Transportation Safety Board, Washington, D. C.
STATISTICAL REVIEW OF ALCOHOL-INVOLVED AVIATION ACCIDENTS Safety Study, 1975 - 1981
1 May 1984 28 p
(NTSB/SS-84/03) Avail: NTIS HC A03/MF A01

During the years 1975-1981, more than 10 percent of the toxicological tests on deceased pilots were positive for alcohol. However, no pilot of a U.S. certificated air carrier operated under 14 CFR 121 was found to have a positive alcohol test since at least 1964. Toxicological tests were positive for alcohol in 6.4 percent of the tests taken from fatally injured scheduled 14 CFR 135 (commuter) pilots and in 7.4 percent of fatally injured pilots in nonscheduled 14 CFR 135 (on demand air taxi) operations. In general aviation, 10.5 percent of toxicological tests on fatally injured pilots were positive for alcohol. The extent of which alcohol is involved in nonfatal accidents is not known because there is no Federal authority to test surviving pilots for alcohol. Positive toxicological tests were obtained from pilots of all certificate levels and all levels of flight-time, indicating that experience cannot and does not compensate for the performance degradation caused by alcohol. Author

N84-25682# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
HELICOPTER PILOT/COPILOT SURVIVAL SYSTEM
G. P. Gillespie Jun. 1983 8 p
(AD-A140358; NADC-83098-60) Avail: NTIS HC A02/MF A01 CSCL 06/7

The Helicopter Pilot/Copilot Survival System described in this report is designed for pilots, copilots and other aircrewmen who perform similar functions as stationary aircrewmen. They require a survival system designed to provide the necessary survival capabilities to cover a wide range of emergencies when escaping from a downed helicopter. The Helicopter Pilot/Copilot Survival System was designed to be worn constantly during missions over land or water; and to provide armor protection, flotation capability, lift compatibility, and use of survival items. The system and its subsystems are compatible with current aircrew requirements and do not interfere with the standard duties of the wearer. The purpose of this report is to document the development to-date, of this Helicopter Pilot/Copilot Survival System. Due to this system's present unfunded status, development has been curtailed. Upon resumption of development, this report will be utilized to assist those involved in future development of this system. GRA

N84-25683# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
CABIN SAFETY SUBJECT INDEX
D. W. Pollard, J. A. Steen, W. J. Biron, and R. L. Cremer Jan. 1984 17 p
(AD-A140409; FAA-AM-84-1) Avail: NTIS HC A02/MF A01 CSCL 05/2

The most frequently used Federal Aviation Administration published cabin safety information is indexed and cross referenced. This includes Federal Aviation Regulations numbers, Air Carrier Operations Bulletin numbers, Advisory Circular numbers, and Office of Aviation Medicine report numbers. Author (GRA)

N84-26289# Danish Defence Command, Vedbaek. Aeromedical Services.
AEROMEDICAL SUPPORT OF HELICOPTER MEDICAL EVACUATION AND RESCUE OPERATIONS
Kund Jessen *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 5p (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-25684*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
INVESTIGATION OF IMAGE ENHANCEMENT TECHNIQUES FOR THE DEVELOPMENT OF A SELF-CONTAINED AIRBORNE RADAR NAVIGATION SYSTEM
Anil V. Phatak and Mehebub S. Karmali Jul. 1983 73 p refs
(Contract NAS2-11276)
(NASA-CR-166530; NAS 1.26:166530; AMA-83-12) Avail: NTIS HC A04/MF A01 CSCL 17G

This study was devoted to an investigation of the feasibility of applying advanced image processing techniques to enhance radar image characteristics that are pertinent to the pilot's navigation and guidance task. Millimeter (95 GHz) wave radar images for the overwater (i.e., offshore oil rigs) and overland (Heliport) scenario were used as a data base. The purpose of the study was to determine the applicability of image enhancement and scene analysis algorithms to detect and improve target characteristics (i.e., manmade objects such as buildings, parking lots, cars, roads, helicopters, towers, landing pads, etc.) that would be helpful to the pilot in determining his own position/orientation with respect to the outside world and assist him in the navigation task. Results of this study show that significant improvements in the raw radar image may be obtained using two dimensional image processing algorithms. In the overwater case, it is possible to remove the ocean clutter by thresholding the image data, and furthermore to extract the target boundary as well as the tower and catwalk locations using noise cleaning (e.g., median filter) and edge detection (e.g., Sobel operator) algorithms. B.W.

N84-25685# Radio Technical Commission for Aeronautics, Washington, D. C.
MINIMUM OPERATIONAL PERFORMANCE STANDARDS FOR TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS) AIRBORNE EQUIPMENT, VOLUME 1
23 Sep. 1983 366 p 2 Vol.
(RTCA-DO-185-Vol-1; SC-147-Vol-1) Avail: NTIS HC A16/MF A01

Minimum operational performance standards for the Traffic alert and Collision Avoidance System (TCAS) are described. Equipment applications and operational goals, definition of performance under standard and stressed environmental conditions, and an overview of the collision avoidance algorithms are included. Specific bench and performance tests for the electronic equipment are outlined.
M.A.C.

N84-25686# Radio Technical Commission for Aeronautics, Washington, D. C.
MINIMUM OPERATIONAL PERFORMANCE STANDARDS FOR TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS) AIRBORNE EQUIPMENT, VOLUME 2
23 Sep. 1983 372 p 2 Vol.
(RTCA/DO-185-Vol-2; SC-147-Vol-2) Avail: NTIS HC A16/MF A01

The specifications for the collision avoidance algorithms are presented. The data structures, interfaces, and system parameters used by the Collision Avoidance System. The logic for the main loop, which cycles at a nominal rate of once per second and calls the tasks contained in later sections, and the logic performed when a Traffic Alert and Collision Avoidance System (TCAS) related message is received through the Mode S transponder is described. The tracking algorithms for intruder aircraft and own aircraft altitude and sensitivity level are defined. The threat detection

algorithms are included. The logic for selection of resolution advisories, for coordination with equipped threats, and cleanup of data structures is examined. The algorithms for generating traffic advisories, and the composite display of resolution and traffic advisories are explained. M.A.C.

N84-25687# Human Engineering Labs., Aberdeen Proving Ground, Md.
EMULATION OF A VOICE INTERACTIVE DOPPLER NAVIGATION SET Final Technical Note
R. G. Hackenberg and F. J. Malkin Mar. 1984 27 p
(AD-A140204; HEL-TN-5-84) Avail: NTIS HC A03/MF A01 CSCL 09/2

Software emulating the operation of the Doppler Navigation Set entirely by voice commands is described. The software, written in Microsoft BASIC using a vocabulary of 67 words, is implemented on the Interstate Electronics VRT 103 Voice Recognition Terminal. Procedural diagrams illustrating the man-machine interaction occurring during the program's subroutines are included. Author (GRA)

N84-25688# Systems Control Technology, Inc., West Palm Beach, Fla.
CONUS (CONTINENTAL UNITED STATES) OMEGA/VLF DATA COLLECTION: FLIGHT TEST Final Report
L. D. King and E. D. McConkey Dec. 1983 114 p
(Grant DOT-FA01-80-C-10080)
(AD-A140252; FAA/PM-83/35) Avail: NTIS HC A06/MF A01 CSCL 17/7

This report contains the description and results of an Omega/VLF flight program conducted in the continental United States (CONUS). The data collection period was during May 1983. The purpose of the program was to collect Omega and VLF signal coverage and accuracy data representative of low altitude, low speed operations typical of helicopters and general aviation aircraft. The aircraft used was a Beechcraft Queen Air, Model 65. The aircraft was configured with a data collection palate and multipin electrical connectors located in the aircraft cabin. An ARINC 599 type Omega/VLF navigation receiver was used in the project. A flat plate, E-field antenna was mounted in the bottom of the fuselage near the empennage. A microprocessor controlled data collection system, utilizing a scanning DME and other aircraft navigation instruments, was used to record data and establish aircraft reference position. Route segments, totaling over 7000 nm covering much of CONUS, were flown during the project. Data were recorded on all route segments. Over 7000 data points were used in the accuracy analysis. GRA

N84-25689# Army Missile Command, Redstone Arsenal, Ala. Guidance and Control Directorate.
A FIELD EVALUATION OF THE BENDIX GYROCOMPASS NAVIGATION SYSTEM LAND NAVIGATOR
S. G. McDaniel Feb. 1984 14 p
(AD-A140368; AD-E950515; DRSMI/RG-84-6-TR) Avail: NTIS HC A02/MF A01 CSCL 17/7

The Bendix Gyrocompass Navigation System (GNS) is a low cost, moderately accurate land navigator intended for use in combat and service vehicles not requiring the accuracy of a weapon delivery system. A GNS was field evaluated. The course traversed included paved roads, dirt roads, and an extreme elevation change. The results including system and vehicle errors indicate a 1.40% of distance traveled system. Author (GRA)

N84-25690# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
MATERIALS RESEARCH FOR ADVANCED INERTIAL INSTRUMENTATION. TASK 2: GAS BEARING MATERIAL DEVELOPMENT Final Report, 1 Oct. 1977 - 31 Dec. 1983
K. Kumar, H. Newborn, and D. Das Feb. 1984 92 p
(Contract N00014-77-C-0388)
(AD-A140435; CSDL-R-1694) Avail: NTIS HC A05/MF A01 CSCL 17/7

The gas bearing materials research program was pursued with the aim of producing novel materials, with new technologies, for applicability to advanced inertial instrument designs. The objective was to produce low friction, high wear-resistance, high integrity gas bearing surfaces that were integrated within a beryllium structure. It was required that these surfaces not be limited in performance by factors known to influence existing hardware, such as porosity, adhesion, and nonconformity in physical properties to the several structural components. Three approaches were selected to achieve the desired gas bearing surface. These included investigating reactive-diffusion bonded CVD-boron films on beryllium, boron-ion implanted beryllium surfaces, and the Be-TiB2 metal matrix composites. CVD-boron deposition on beryllium was found to proceed well in a high vacuum, bakeable, all stainless chamber. The successful procedure involved thermal decomposition of diborane on a beryllium sample surface which was heated by RF induction to about 700 to 800 C. Boron-ion implantation was performed on specially prepared beryllium surfaces, using a high current machine, up to boron concentrations of well over 50 atom percent. The Be-TiB2 composites were produced by hot isostatic pressing (HIP) of blended and cold compacted beryllium and titanium diboride powders. GRA

N84-25691# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
ADVANCES IN STRAPDOWN INERTIAL SYSTEMS
Apr. 1984 225 p refs In ENGLISH and FRENCH Lecture held in Athens, 14-15 May 1984, in Rome, 17-18 May 1984, and in Copenhagen, 21-22 May 1984
(AGARD-LS-133; ISBN-92-835-0351) Avail: NTIS HC A10/MF A01

Advances in strapdown inertial system technology during the last five years are addressed. Areas include advances in strapdown instruments, computational algorithms and the application to commercial aircraft, remotely. Piloted vehicles, flight controls, instrumentation, and navigation problems in general. For individual titles, see N84-25692 through N84-25699.

N84-25692# Draper (Charles Stark) Lab., Inc., Cambridge, Mass. G&N Advanced Programs Div.
ADVANCES IN STRAPDOWN INERTIAL SYSTEMS: INTRODUCTION AND OVERVIEW
George T. Schmidt *In* AGARD Advan. in Strapdown Inertial Systems Apr. 1984 4p ref (For primary document see N84-25691 16-04)
Avail: NTIS HC A10/MF A01

The significant advances in strapdown inertial system technology since the last Lecture Series (No. 95) in 1978 on the subject are presented. Areas that are addressed in the Lecture Series include advances in strapdown instruments and computational algorithms and the applications to commercial aircraft, remotely piloted vehicles, flight controls, instrumentation, and navigation problems in general. Author

N84-25693# Strapdown Associates, Inc., Minnetonka, Minn.
ADVANCES IN STRAPDOWN SENSORS
Paul G. Savage *In* AGARD Advan. in Strapdown Inertial Systems Apr. 1984 24p refs (For primary document see N84-25691 16-04)
Avail: NTIS HC A10/MF A01

The advanced that have taken place in strapdown sensor technology since 1978 are reviewed. Principal areas addressed in strapdown gyro technology are the state of the art in mainstream floated rate-integrating and tuned-rotor strapdown gyros, performance advances in laser gyros, specical design considerations associated with mechanically dithered laser gyros, the state of the art in magnetic mirror and multioscillator laser gyros, present and projected application areas for laser gyros related to size, performance and cost, the theory of operation and state of the art in fiber optic rate sensor technology, and the fundamental distinctions between the laser gyro and fiber optic rate sensor. Basic areas addressed in strapdown accelerometer technology are performance advances in pendulous accelerometers, and the theory of operation and state of the art in vibrating beam accelerometer technology. Author

N84-25694# Strapdown Associates, Inc., Minnetonka, Minn.
STRAPDOWN SYSTEM ALGORITHMS
Paul G. Savage *In* AGARD Advan. in Strapdown Inertial Systems Apr. 1984 30p refs (For primary document see N84-25691 16-04)
Avail: NTIS HC A10/MF A01

The attitude determination, acceleration transformation, and attitude/heading output computational operations performed in modern day strapdown inertial navigation systems are addressed. Contemporary algorithms are described for implementing these operations in real time computers. The attitude determination and acceleration transformation algorithm discussions are based on the two speed approach in which high frequency coning and sculling effects are calculated with simplified high speed algorithms, with results fed into lower speed higher order algorithms. This is the approach that is typically used in most modern day strapdown systems. Design equations are included for evaluating the performance of the strapdown computer algorithms as a function of computer execution speed and sensor assembly vibration amplitude/frequency/phase environment. Both direction cosine and quaternion based attitude algorithms are described and compared in light of modern day algorithm accuracy capabilities. Orthogonality and normalization operations are addressed for potential attitude algorithm accuracy enhancement. The section on attitude data output algorithms includes a discussion on roll/yaw Euler angle singularities near high/low pitch angle conditions. Author

N84-25695# Boeing Commercial Airplane Co., Seattle, Wash. Navigation Sensors/Displays Dept.
REQUIREMENTS, APPLICATIONS, AND RESULTS OF STRAPDOWN INERTIAL TECHNOLOGY TO COMMERCIAL AIRPLANES
Phillip J. Fenner *In* AGARD Advan. in Strapdown Inertial Systems Apr. 1984 47p refs (For primary document see N84-25691 16-04)
Avail: NTIS HC A10/MF A01

The basis for selection of strapdown inertial system for short to medium range jet transports is discussed. Inertial data requirements and associated performance requirements are shown for commercial airplanes. Good performance at low cost and high reliability are key requirements of inertial technology application to commercial airplanes which do not have a long range navigation need. The Honeywell laser inertial reference system (IRS) selected by Boeing for the 757/767/737 airplanes is described, along with airplane installation and interface details. Test programs instituted to validate the design and reduce program risk are described. Performance and reliability experience data from Boeing flight tests, and over the first year of airline service, are shown to exceed expectations. Author

N84-25696# Societe de Fabrication d'Instruments de Mesure, Massy (France). Strapdown Systems Engineering Group.
STRAPDOWN INERTIAL SYSTEMS FOR TACTICAL MISSILES USING MASS UNBALANCED TWO-AXIS RATE GYROS
J. L. Michelin and P. Masson (Lab. de Recherches Balistiques et Aerodynamiques.) *In* AGARD Advan. in Strapdown Inertial Systems Apr. 1984 41p (For primary document see N84-25691 16-04)
Avail: NTIS HC A10/MF A01

In 1979, SFIM began work on strapdown inertial systems using two axis dry tuned gyros (DTG). Since the first feasibility developments SFIM has worked on a large number of applications, the most important being for tactical missiles. All current developments are based on the same concepts - mass unbalanced gyros (M.U.G.) - fully digitized electronics - leading to a systems family - SIL 1 (Systmems Inertiels lies) - in which the cost and volume requirements are the essential points. The basic ideas, some examples of utilization and the test results obtained on some functional models and prototypes by SFIM and essentially by LRBA are presented. Author

N84-25697# Draper (Charles Stark) Lab., Inc., Cambridge, Mass. Inertial Subsystem Div.
MODULAR STRAPDOWN GUIDANCE UNIT WITH EMBEDDED MICROPROCESSORS
Jerold P. Gilmore *In* AGARD Advan. in Strapdown Inertial Systems Apr. 1984 16p refs Previously announced as A80-18534 (For primary document see N84-25691 16-04)
(Contract F08635-76-C-0306)
Avail: NTIS HC A10/MF A01

The Low-Cost Inertial Guidance System (LCIGS) is a modular strapdown implementation of attitude (gyro) and velocity (accelerometer) axes which permits the interchangeable use of different manufacturer's instruments without affecting the system's electronic or mechanical interfaces or processing software. This design flexibility is made possible by the use of microprocessors for processing and control. The microprocessors are embedded in each module and five are used: one per accelerometer triad, one each per gyro module, and one in the service module. The processors effect on-line digital torquing control of the gyros, active instrument error model compensation, including modeling for temperature sensitivity effects, temperature control, self-testing, etc. Adaptation of processing and calibration algorithms to accommodate for instrument changes or sensed environmental variations is achieved through the use of an alterable read-only data base that may be updated by the LCIGS support equipment as required at calibrations or upon an instrument replacement. This data base is accessed by the microprocessors and used to compute coefficient corrections for the processing algorithms. The system architecture is presented and the microprocessor software partitioning and functions are described. (Author) IAA

N84-25698# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
APPLICATION OF MULTIFUNCTION STRAPDOWN INERTIAL SYSTEM
David L. Sebring (McDonnell Douglas Corp., St. Louis), John M. Perdzock, and John T. Young *In* AGARD Advan. in Strapdown Inertial Systems Apr. 1984 20p refs (For primary document see N84-25691 16-04)
Avail: NTIS HC A10/MF A01

Reliability, redundancy, and survivability are key issues as integrated requirements for flight control, fire control, propulsion control and navigation are developed. These integrated systems require dependable sources of inertial measurement data. Current inertial sensors, however, are expensive to acquire and maintain, dedicated to specific systems, and are not designed to meet integrated reliability, redundancy, and survivability requirements. The Multifunction Strapdown Inertial System concept uses a minimum number of inertial sensors in a survivable configuration to provide inertial data for flight control, navigation, weapon delivery, cockpit displays, and sensor stabilization. Because of advantages in survivability, life cycle cost, maintainability and performance, the Multifunction Flight Control Reference System (MFCRS) program was initiated to verify, through flight test, on a McDonnell Douglas F-15 Eagle the key issues of redundancy management and flight control. A redundancy management system based on parity equations was designed. Author

N84-25699# Litton Technische Werke, Freiburg (West Germany). Systems Design Dept.
INITIAL ALIGNMENT AND AUGMENTATION OF THE ARINC 705 STRAPDOWN AHRS LTR-81
W. Hassenpflug and M. Kleinschmidt *In* AGARD Advan. in Strapdown Inertial Systems Apr. 1984 14p refs (For primary document see N84-25691 16-04)
Avail: NTIS HC A10/MF A01

After systems hardware description the attitude, heading and vertical loops are discussed. System simulation results are compared with flight test results achieved during A 300 B4 FFC flight certification and BMFT/LITEF sponsored flight tests. Techniques for further system improvements are shortly described. Author

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-25700# Cranfield Inst. of Tech., Bedfordshire (England). College of Aeronautics.

A TECHNIQUE FOR OPTIMIZING THE AERODYNAMIC DESIGN OF A GENERALIZED COMBAT AIRCRAFT WITH FORWARD SWEPT WINGS FOR THE PURPOSES OF STABILITY AND CONTROL INVESTIGATION

M. V. Cook and S. J. P. ORiordan Jan. 1984 87 p refs (CA-8325) Avail: NTIS HC A05/MF A01

A technique was developed to optimize the airframe for aerodynamic performance of a genaralized combat aircraft with a forward swept wing with close coupled canard. A computer program was written and its output includes geometric and other parameters as a required for stability and control studies. A second computer program was written to estimate the aerodynamic stability and control derivatives of an optimized airframe. Two airframes with a single engine and with two engines were investigated. The flying qualities problems arising from the configurations were studied. An analogue simulation was carried out which highlighted some problems resulting from the longitudinal static instability inherent in both configurations. A trade off between the requirement for minimum weight and the stability characteristics is undertaken. E.A.K.

N84-25701*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

F-14 MODELING STUDY Final Report

William H. Levison and Sheldon Baron May 1984 91 p refs (Contract NAS1-16738)

(NASA-CR-172336; NAS 1.26:172336) Avail: NTIS HC A05/MF A01 CSCL 01C

Preliminary results in the application of a closed loop pilot/simulator model to the analysis of some simulator fidelity issues are discussed in the context of an air to air target tracking task. The closed loop model is described briefly. Then, problem simplifications that are employed to reduce computational costs are discussed. Finally, model results showing sensitivity of performance to various assumptions concerning the simulator and/or the pilot are presented. M.G.

N84-25702*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

STRUCTURAL SIZING OF A SOLAR POWERED AIRCRAFT Final Report

David W. Hall and Stan A. Hall Apr. 1984 105 p refs (Contract NAS1-16975)

(NASA-CR-172313; NAS 1.26:172313; LMSC-D878711) Avail: NTIS HC A06/MF A01 CSCL 01C

The development of sizing algorithms for very lightweight aircraft structure was studied. Three types of bracing schemes were analyzed and fully cantilevered strut bracing and wire bracing and scaling rules were determined. It is found that wire bracing provides the lightest wing structure for solar high altitude powered platforms. E.A.K.

N84-25703# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.

RENOVATION OF THE HELICE [LA RENOVATION DE L'HELICE]

D. Berger and P. Jacquet 23 Feb. 1984 25 p In FRENCH Presented at Salon Intern. Des Tech. et Energies Du Futur (SITEF) 83, Toulouse, 18 - 23 Oct. 1983

(SNIAS-832-111-109; Rept-474.145/83) Avail: NTIS HC A02/MF A01

Technical, economic, and political reasons for renewed interest in propulsion by propeller are examined. Manifestations of this revival are new aircraft programs and studies conducted by the designers of propellers and aircraft engines. Highlights of the American Advanced Turboprop project (propfan technology) are included. The French program for developing propellers for aircraft capable of flight between 0.7 and 0.8 Mach number is emphasized. Transl. by A.R.H.

N84-25704# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.

CARBON STRUCTURES ON THE WING OF THE REGIONAL TRANSPORT PLANE ATR-42 [LES STRUCTURES DU CARBONE SUR LA VOILURE DE L'AVION DE TRANSPORT REGIONAL ATR-42]

G. Hellard 23 Feb. 1984 17 p In FRENCH Presented at SAMPE Conf., Bordeaux, 17 - 20 Oct. 1983

(SNIAS-832-111-113) Avail: NTIS HC A02/MF A01

The A.T.R. 42 aircraft, capable of transporting from 42 to 50 passengers a maximum distance of 1760 km, has a number of important structural composites on the wing as well as the fuselage and the empennages. Kevlar and the hybrid Kevlar/carbon are used for the wing unit. Carbon fibers are used for the ailerons and the high lift flaps. Studies conducted to define the best performing material for the ailerons and flaps, at minimal cost, are described. It was found that the monolithic multiribbed box are best for the wing and that carbon/Nida sandwich structures are best for the flaps. These elements were certified by static tests and fatigue/aging test of the entire part. A.R.H.

N84-25705# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.

SYSTEM CONCEPTS FOR HELICOPTER AIR-TO-AIR COMBAT

Brunello, Letouzey, Scaramuzzino, and Catani 1983 4 p Presented at the AAAF 8th European Rotorcraft and Powered Lift Aircraft Forum, Aix-en-Provence, France, 31 Aug - 3 Sep. 1982

(SNIAS-832-210-102) Avail: NTIS HC A02/MF A01

A simulation method for helicopter air to air combat is described. A model is developed and firing data is compared through actual sighting and firing experiments. Examples of firing simulation and subsequent accuracy are examined. M.A.C.

N84-25706# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.

THE DEVELOPMENT OF THE NAVY VARIANT OF THE DAUPHIN 2 HELICOPTER

A. Cassier 1983 12 p Presented at the AAAF 9th European Rotorcraft and Powered Lift Aircraft Forum, Stresa, Italy, 13-15 Sep. 1983

(SNIAS-832-210-106) Avail: NTIS HC A02/MF A01

AEROSPATIALE'S SA 365 DAUPHIN is a new generation 4 tons helicopter. It has been designed to meet civil and military operator's requirements in various configurations. The civil version, SA 365 N, has been in service since 1981; it is particularly well suited for passengers' transport or offshore missions. This multipurpose helicopter is easily adapted to military roles. The naval version, SA 365 F, was developed in 1981 and is being delivered now. SA 365 F is available in several configurations for Search and Rescue (SAR), Anti Surface Vessel Warfare (ASV) and Anti Submarine Warfare (ASW) missions. The purpose of this expose is to review the main characteristics of these various configurations and to discuss the development of this helicopter. Author

N84-25707# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.

AEROSPATIALE'S EXPERIENCE ON HELICOPTER FLIGHT IN ICING CONDITIONS

Denis Trivier and Gaston Avedissian 1983 10 p refs Presented at the AAAF 9th European Rotorcraft and Powered Life Aircraft Forum, Stresa, Italy, 13-15 Sep. 1983

(SNIAS-832-210-107) Avail: NTIS HC A02/MF A01

Helicopter rotor icing protection systems are evaluated through flight tests under actual icing conditions. The development of a practical flight envelope which considers altitude, temperature, and icing severity is discussed. Flights without deicing protection are

conducted to determine flight characteristics under total system failure. M.A.C.

N84-25708# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flaechenflugzeuge.
A COMPARISON OF PARAMETER ESTIMATION RESULTS FROM FLIGHT TEST DATA USING LINEAR AND NONLINEAR MAXIMUM LIKELIHOOD METHODS
David Brian Mackie Dec. 1983 67 p refs
(DFVLR-FB-84-06) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 23

A comparison has been made for parameter estimation results from flight test data using a linear and a general nonlinear maximum likelihood method. The successful application of the nonlinear ML method to data compatibility checking and to correction of measurement data has been demonstrated. Five different aircraft system equation models, utilizing various sets of dimensional or nondimensional aircraft coefficients, were developed for use in the parameter estimation. Results of the ML parameter estimations have been presented and compared from plots of curve fits and tables of parameters. A general set of conclusions and recommendations is given. Author

N84-25709# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flaechenflugzeuge.
DESIGN AND IMPLEMENTATION OF INPUT SIGNALS FOR IDENTIFICATION OF PILOT/AIRCRAFT MODELS
Ruthard Koehler Jan. 1984 45 p refs In GERMAN; ENGLISH summary Translation will also be announced as ESA-TT-880
(DFVLR-FB-84-08; ESA-TT-880) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 17

A flight test method to investigate flying qualities of combat aircraft in ground attack maneuvers is presented. Simulated attacks to dynamically switched ground based targets are carried out to assess flying qualities and to identify pilot/aircraft systems. The method has been successfully applied in pilot rating tests. This report deals with the design of input signals and preparation of flight tests. Author

N84-25615# Naval Air Development Center, Warminster, Pa.
CURRENT PROCUREMENT SPECIFICATION DESIGN REQUIREMENTS FOR US NAVY AIRCRAFT
Sara J. Ketcham *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 2 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

N84-25616# Army Materials and Mechanics Research Center, Watertown, Mass.
CURRENT DESIGN REQUIREMENTS FOR CORROSION CONTROL ON HELICOPTERS
M. Levy and R. D. French *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Apr. 1984 5 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

N84-25617# Westland Aircraft Ltd., Yeovil (England).
THE INTERPRETATION OF DESIGN REQUIREMENTS FOR MULTI-MARKET HELICOPTERS
D. R. Hayward *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 3 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

N84-25618# Saab-Space A.B., Linkoeping (Sweden). Materials Lab.
CURRENT REQUIREMENTS ON SPECIFICATIONS FOR CORROSION PREVENTION
Einar Hultgren *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 13 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

N84-25620# Vought Corp., Dallas, Tex. Materials and Processes Dept.
DESIGN AND MANUFACTURING PRACTICES TO MINIMIZE CORROSION IN AIRCRAFT
A. E. Hohman *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 5 p refs (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

N84-25627# British Aerospace Aircraft Group, Kingston-upon-Thames (England).
THE INFLUENCE OF V/STOL ON WING DESIGN AND TAIL-PLANE DESIGN
C. L. Bore *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 6 p (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01

N84-25628*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
V/STOL CONCEPTS IN THE UNITED STATES: PAST, PRESENT, AND FUTURE
W. P. Nelms and S. B. Anderson *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 44 p refs Previously announced as N84-22532 (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01 CSCL 01C

N84-25629# British Aerospace Aircraft Group, Warton (England). Advanced Projects Dept.
LAYOUT CONSIDERATIONS AND TYPES OF V/STOL AIRCRAFT
J. Fletcher *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 36 p ref (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01

N84-25634# British Aerospace Aircraft Group, Kingston-upon-Thames (England).
GROUND BASED TESTING WITHOUT WIND TUNNELS
C. L. Bore *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 6 p refs (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01

N84-25637# British Aerospace Aircraft Group, Kingston-upon-Thames (England).
NOTES ON SPECIAL FLIGHT ASPECTS, SUCH AS STO, SKI-JUMP AND ODM
C. L. Bore *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 6 p refs (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01

N84-26437 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich.
THE AIRBUS: THE STATE-OF-THE-ART TODAY, AND FUTURE DEVELOPMENTS [DER AIRBUS: HEUTIGER STAND UND ZUKUENFTIGE ENTWICKLUNGEN]
H. G. Klug *In its* Tech. and Sci. Publ. 1983 1983 p 109-118 In GERMAN Presented at Haus der Tech., Essen, 16 Nov. 1982 (For primary document see N84-26430 16-81)
(MBB-UT-22-83-O) Avail: Issuing Activity

N84-26439 Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany). Werkstoff-und Verfahrenstechnik.
SUCCESSFUL UTILIZATION OF ECONOMIC, LIGHT ALUMINUM-CASTED STRUCTURES IN AIRPLANE CONSTRUCTION [ERFOLGREICHE EINFUEHRUNG WIRTSCHAFTLICHER UND LEICHTER ALUMINIUM-GUSSSTRUKTUREN IM FLUGZEUGBAU]
D. Mietrach *In* MBB Tech. and Sci. Publ. 1983 1983 p 139-157 refs In GERMAN Presented at Lehrgang: Ontwerpen en Gieten van Hoogwaardige Construct., Delft, 19-20 Oct. 1983 (For primary document see N84-26430 16-81)
(VFW-31/83-O) Avail: Issuing Activity

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-25710*# Flow Research, Inc., Kent, Wash.
DIRECT SIMULATIONS OF CHEMICALLY REACTING TURBULENT MIXING LAYERS Final Report
James J. Riley and Ralph W. Metcalfe Mar. 1984 149 p refs (Contract NAS3-23531)
(NASA-CR-174640; NAS 1.26:174640; Rept-274) Avail: NTIS HC A07/MF A01 CSCL 20D

The report presents the results of direct numerical simulations of chemically reacting turbulent mixing layers. The work consists of two parts: (1) the development and testing of a spectral numerical computer code that treats the diffusion reaction equations; and (2) the simulation of a series of cases of chemical reactions occurring on mixing layers. The reaction considered is a binary, irreversible reaction with no heat release. The reacting species are nonpremixed. The results of the numerical tests indicate that the high accuracy of the spectral methods observed for rigid body rotation are also obtained when diffusion, reaction, and more complex flows are considered. In the simulations, the effects of vortex rollup and smaller scale turbulence on the overall reaction rates are investigated. The simulation results are found to be in approximate agreement with similarity theory. Comparisons of simulation results with certain modeling hypotheses indicate limitations in these hypotheses. The nondimensional product thickness computed from the simulations is compared with laboratory values and is found to be in reasonable agreement, especially since there are no adjustable constants in the method.
Author

N84-25711*# TRW, Inc., Cleveland, Ohio. Materials and Manufacturing Technology Center.
FABRICATION DEVELOPMENT FOR ODS-SUPERALLOY, AIR-COOLED TURBINE BLADES
Donald J. Moracz Jan. 1984 105 p refs
(Contract NAS3-22507)
(NASA-CR-174650; NAS 1.26:174650; ER-8162-F) Avail: NTIS HC A06/MF A01 CSCL 21E

MA-600 is a gamma prime and oxide dispersion strengthened superalloy made by mechanical alloying. At the initiation of this program, MA-6000 was available as an experimental alloy only and did not go into production until late in the program. The objective of this program was to develop a thermal-mechanical-processing approach which would yield the necessary elongated grain structure and desirable mechanical properties after conventional press forging. Forging evaluations were performed to select optimum thermal-mechanical-processing conditions. These forging evaluations indicated that MA-6000 was extremely sensitive to die chilling. In order to conventionally hot forge the alloy, an adherent cladding, either the original extrusion can or a thick plating, was required to prevent cracking of the workpiece. Die design must reflect the requirement of cladding. MA-6000 was found to be sensitive to the forging temperature. The correct temperature required to obtain the proper grain structure after recrystallization was found to be between 1010-1065 C (1850-1950 F). The deformation level did not affect subsequent crystallization; however, sharp transition areas in tooling designs should be avoided in forming a blade shape because of the potential for grain structure discontinuities. Starting material to be used for forging should be processed so that it is capable of being zone annealed to a coarse elongated grain structure as bar stock. This conclusion means that standard processed bar materials can be used.
Author

N84-25712*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEVELOPMENT OF DYNAMIC SIMULATION OF TF34-GE-100 TURBOFAN ENGINE WITH POST-STALL CAPABILITY
Susan M. Krosel 1984 11 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984
(NASA-TM-83660; E-2104; NAS 1.15:83660; AIAA-84-1184) Avail: NTIS HC A02/MF A01 CSCL 21E

This paper describes the development of a hybrid computer simulation of a TF34-GE-100 turbofan engine with post-stall capability. The simulation operates in real-time and will be used to test and evaluate stall recovery control modes for this engine. The simulation calculations are performed by an analog computer with a peripheral multivariable function generation unit used for computing bivariate functions. Tabular listings of a simulation variables are obtained by interfacing to a digital computer and using a custom software package for data collection and display.
Author

N84-25713*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ON MODELING DILUTION JET FLOWFIELDS
J. D. Holdeman and R. Srinivasan (Garrett Turbine Engine Co.) 1984 19 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984
(NASA-TM-83708; E-2168; NAS 1.15:83708; AIAA-84-1379) Avail: NTIS HC A02/MF A01 CSCL 21E

This paper compares temperature field measurements from selected experiments on a single row, and opposed rows, of jets injected into a ducted crossflow with profiles calculated using an empirical model based on assumed vertical profile similarity and superposition, and distributions calculated with a 3-D elliptic code using a standard K-E turbulence model. The empirical model predictions are very good within the range of the generating experiments, and the numerical model resultings, although exhibiting too little mixing, correctly describe the effects of the principal flow and geometric variables.
Author

N84-25714# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.
FULL AUTHORITY DIGITAL ENGINE CONTROL (FADEC)
A. Garcia 23 Feb. 1984 38 p Presented at ENAC Seminar on Evolution Des Systemes De Bord, Toulouse, 25 Apr. 1983
(SNIAS-832-111-101) Avail: NTIS HC A03/MF A01

Systems and control functions of the A-310 airbus are reviewed and full engine control for the A-320 is described. Topics covered include gas generator control, engine limit protection, automatic starting, reverse feedback, power management, and engine condition monitoring parameters. Systems architecture, electrical supplies, interfaces with the aircraft, safety objectives, and precautions taken during construction are also discussed. Perspectives for weight savings and reduction in fuel burn are included.
Transl. by A.R.H.

N84-25715# European Space Agency, Paris (France).
COMPARISON OF A PROPFAN/TURBOFAN ENGINE BY THERMODYNAMIC CYCLE CALCULATION
Peter Schimming Oct. 1983 44 p refs Transl. into ENGLISH of "Vergleichende kreisprozessrechnungen fuer ein propfan-/tubofan-triebwerk" rept. DFVLR-Mitt-82-18 DFVLR, Goettingen, West Germany, Nov. 1982 Original language document announced as N83-30431

(ESA-TT-820; DFVLR-Mitt-82-18) Avail: NTIS HC A03/MF A01; original German report available from DFVLR, Cologne DM 16,80

Propfans are expected to replace turbofans in commercial subsonic, air transportation systems for short and medium range. Thermodynamic cycle calculations are performed for a propfan and a turbofan propulsion systems for a 150 seat twin engine medium range transport aircraft, in order to obtain the difference in specific fuel consumption. Common definitions for the efficiencies of propeller and fan and common treatment of the thermodynamic cycles form the basis of the analysis. M.A.C.

N84-25630# Rolls-Royce Ltd., Bristol (England).
V/STOL PROPULSION SYSTEM AERODYNAMICS
W. J. Lewis *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 24 p (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01

N84-25728# National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
PERFORMANCE DERIVATION OF TURBOJETS AND TURBOFANS FROM TESTS IN SEA-LEVEL TEST CELLS
D. M. Rudnitski *In* AGARD Operational and Performance Meas. on Eng. in Sea Level Test Facilities Mar. 1984 22p refs (For primary document see N84-25723 16-09)
Avail: NTIS HC A09/MF A01

N84-26438 Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
GROUND AND INFLIGHT OPERATIONAL EFFECTS OF APU'S
J. H. Renken *In* MBB Tech. and Sci. Publ. 1983 1983 p 119-137 Presented at AGARD Propulsion and Energetics (PEP) Meeting/ Specialists' Meeting on Auxiliary Power Systems, Copenhagen, 30-31 May 1983 (For primary document see N84-26430 16-81)
(VFW-30/83-O) Avail: Issuing Activity

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-25716*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
VTOL SHIPBOARD LETDOWN GUIDANCE SYSTEM ANALYSIS
Anil V. Phatak and Mehebub S. Karmali May 1983 60 p refs (Contract NAS2-10288)
(NASA-CR-166519; NAS 1.26:166519; AMA-82-43) Avail: NTIS HC A04/MF A01 CSCL 01C

Alternative letdown guidance strategies are examined for landing of a VTOL aircraft onboard a small aviation ship under adverse environmental conditions. Off line computer simulation of shipboard landing task is utilized for assessing the relative merits of the proposed guidance schemes. The touchdown performance of a nominal constant rate of descent (CROD) letdown strategy serves as a benchmark for ranking the performance of the alternative letdown schemes. Analysis of ship motion time histories indicates the existence of an alternating sequence of quiescent and rough motions called lulls and swells. A real time algorithms lull/swell classification based upon ship motion pattern features is developed. The classification algorithm is used to command a go/no go signal to indicate the initiation and termination of an acceptable landing window. Simulation results show that such a go/no go pattern based letdown guidance strategy improves touchdown performance. M.A.C.

N84-25717*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN ALGORITHM FOR MAXIMUM LIKELIHOOD ESTIMATION USING AN EFFICIENT METHOD FOR APPROXIMATING SENSITIVITIES
Patrick C. Murphy Jun. 1984 38 p refs
(NASA-TP-2311; L-15735; NAS 1.60:2311) Avail: NTIS HC A03/MF A01 CSCL 01C

An algorithm for maximum likelihood (ML) estimation is developed primarily for multivariable dynamic systems. The algorithm relies on a new optimization method referred to as a modified Newton-Raphson with estimated sensitivities (MNRES). The method determines sensitivities by using slope information from local surface approximations of each output variable in parameter space. The fitted surface allows sensitivity information to be updated at each iteration with a significant reduction in computational effort compared with integrating the analytically determined sensitivity equations or using a finite-difference method. Different surface-fitting methods are discussed and demonstrated. Aircraft estimation problems are solved by using both simulated and real-flight data to compare MNRES with commonly used methods; in these solutions MNRES is found to be equally accurate and substantially faster. MNRES eliminates the need to derive sensitivity equations, thus producing a more generally applicable algorithm. Author

N84-25718# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany).
PROBLEMS OF SYSTEM IDENTIFICATION IN FLIGHT VIBRATION TESTING
Klaus Koenig [1983] 27 p refs Presented at the 5th Meeting of the Struct. and Mater. Panel held in Vimeiro, Portugal, 9-14 Oct. 1983
(AGARD-R-720) Avail: NTIS HC A03/MF A01

The state of the art of system identification in flight vibration tests is investigated. The accuracy of modal data analysis is studied for two tests with eight different methods of analysis. M.A.C.

N84-25719# Naval Postgraduate School, Monterey, Calif.
COMPUTER PROGRAM TO SIMULATE DIGITAL COMPUTER BASED LONGITUDINAL FLIGHT CONTROL LAWS IN A HIGH PERFORMANCE AIRCRAFT M.S. Thesis
J. R. Carter Dec. 1983 73 p
(AD-A140143) Avail: NTIS HC A04/MF A01 CSCL 01/4

The IBM Company's Continuous Systems Modeling Program was used to simulate the longitudinal flight control system of the F/A-18 aircraft. The model is intended for use in investigations of aircraft response to flight conditions which approach spin or stall and is restricted to the automatic flaps up (AFU) flight mode. Program outputs include stabilator deflection, leading and trailing edge flap positions, and cross-axis interconnect signals. Various stick forces, motion sensor inputs and air pressure inputs were simulated to produce transient control surface responses. These computer generated responses exhibited characteristics corresponding to predicted aircraft control surface movements.
Author (GRA)

N84-25720# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ROBUSTNESS QUALIFICATION AND IMPROVEMENT OF MULTIVARIABLE REGULATORS, WITH APPLICATION TO AIRPLANE CONTROL Ph.D. Thesis - Institut National Polytechnique de Grenoble
Henri Bourles 1983 101 p refs In FRENCH; ENGLISH summary Report will also be announced as ESA-TT-867
(ONERA-NT-1983-2; ISSN-0078-3781; ESA-TT-867) Avail: NTIS HC A06/MF A01

The robustness of a dynamic system multivariable control law was analyzed and quantified with respect to external disturbances, structural perturbations due to modeling and linearization errors, and dynamic perturbations in the feedback loop. This proportional plus integral type control law minimizes the mathematical expectation of a quadratic performance index. Stability margins (especially the phase margin) of linear quadratic regulators are generalized. An algorithm is provided that adjusts the cost penalty matrices iteratively to increase the system robustness. Author

N84-25632*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

V/STOL MANEUVERABILITY AND CONTROL
James A. Franklin and Seth B. Anderson *In* AGARD Spec. Course on V/STOL Aerodyn. Apr. 1984 47 p refs Previously announced as N84-22584 (For primary document see N84-25625 16-01)
Avail: NTIS HC A17/MF A01 CSCL 01C

N84-26436 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Flugzeuge.
CSTS: THE SOFTWARE TEST SYSTEM FOR THE TORNADO AUTO PILOT [CSTS: EIN SOFTWARE TESTSYSTEME FUER DEN TORNADO-AUTOPILOTEN]
J. Stocker and J. Rauch *In its* Tech. and Sci. Publ. 1983 1983 p 85-107 refs In GERMAN Presented at DGLR Symp.: Test U. Verifikation von Software bei Digitalen Systemen der Luft-U. Raumfahrt, Cologne, 25-26 Oct. 1983 (For primary document see N84-26430 16-81)
(MBB-FE-325/S/Pub/118) Avail: Issuing Activity

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N84-25721# Washington Univ., Seattle.
A NUMERICAL STUDY OF THE CONTROLLED FLOW TUNNEL FOR A HIGH LIFT MODEL Ph.D. Thesis
Pareshkumar C. Parikh 1984 122 p
Avail: Univ. Microfilms Order No. DA8404937

A controlled flow tunnel employs active control of flow through the walls of the wind tunnel so that the model is in approximately free air conditions during the test. This improves the wind tunnel test environment, enhancing the validity of the experimentally obtained test data. In the present study this concept is applied to a three dimensional jet flapped wing with full span jet flap. It is shown that a special treatment is required for the high energy wake associated with this and other V/STOL models. An iterative numerical scheme is developed to describe working of an actual controlled flow tunnel and comparisons are shown with other available results. It is shown that control need be exerted over only part of the tunnel walls to closely approximate free air flow conditions. It is concluded that such a tunnel is able to produce a nearly interference free test environment even with a high lift model in the tunnel. Dissert. Abstr.

N84-25722# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
MULTICHANNEL DETECTION SYSTEMS AVAILABLE FOR FLOW DIAGNOSTICS AT AEDC Final Report, 1 Oct. 1982 - 30 Sep. 1983
W. D. Williams, H. M. Powell, J. H. Jones, and R. L. McGuire AEDC Aug. 1983 45 p refs Sponsored by Air Force
(AD-A132302; AEDC-TR-83-28) Avail: NTIS HC A03/MF A01 CSCL 14/2

With escalating aerospace ground testing costs, it has become imperative to reduce test duration and yet maintain the quantity and quality of test data. Because many of the non-perturbing flow diagnostic techniques developed at AEDC require a measurement of either induced or spontaneous emitted radiation, data acquisition time can be reduced if the spatial, spectral, and temporal variations of the radiation can be measured simultaneously. To achieve this reduction in data acquisition time, AEDC personnel have developed two multichannel radiation detection systems. The details of these two systems and an assessment of their capabilities are presented, and recommendations for improvements are made. Author

N84-25723# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
OPERATIONAL AND PERFORMANCE MEASUREMENT ON ENGINES IN SEA LEVEL TEST FACILITIES
Loughton, England Mar. 1984 176 p refs Lecture held in Rome, 26-27 Apr. 1984, in Ankara, Turkey, 30 Apr. - 1 May 1984, and in Athens, 3-4 May 1984
(AGARD-LS-132; ISBN-92-835-0350-3) Avail: NTIS HC A09/MF A01

This Lecture Series considers all the basic features of turbojets and turbofan testing. In the introduction, test cell design is set in historical perspective with brief descriptions of the test arrangement and instrumentation used to test the early jet engines. The way in which these have evolved to modern designs is outlined. Three typical uses for sea level test beds, routine proof testing following overhaul, performance evaluation for type certification and general development testing are described and covered in detail by specialist lectures. One lecture is devoted specifically to turboprop testing. Instrumentation and data handling are dealt with in two lectures, one covering measurement techniques and the other covering data acquisitions and handling. One lecture is devoted to the derivation of the performance of the engine from the test bed measurements. For individual titles, see N84-25724 through N84-25731.

N84-25724# Ashwood (P. F.), Farnham (England).
OPERATION AND PERFORMANCE MEASUREMENT ON ENGINES IN SEA-LEVEL TEST FACILITIES: INTRODUCTION AND GENERAL SURVEY
P. F. Ashwood *In* AGARD Operational and Performance Meas. on Eng. in Sea Level Test Facilities Mar. 1984 15p (For primary document see N84-25723 16-09)
Avail: NTIS HC A09/MF A01

Several aspects of sea level testing are reviewed to provide an introduction and background to the specialist papers which make up this Lecture Series. The review commences by setting cell design in historical perspective and considering the facilities that were used in the UK to test the early jet engines. A more modern cell, the Glen Test House at Pyestock, is described in detail because its design contains all the basic features required for testing turbojets and turbofans. Attention is drawn to two areas where the original Glen systems have been enhanced to meet modern requirements: the instrumentation and the method of measuring thrust. Three typical uses for sea level test beds, routine proof testing, performance evaluation and general development testing, are each briefly described and their influence on test bed design and instrumentation requirements discussed. Instrumentation is considered only in outline because of its highly specialist nature, but attention is drawn to the need for the data output to be presented in easily assimilated form, particularly when processing is carried out on line. Finally an account is given of an investigation made at Pyestock under the author's direction to examine the aerodynamic factors which influence thrust measurement. As published information on this topic is still extremely limited, and in view of its relevance to the present Lecture Series, the opportunity has been taken to make the results of these tests more widely available. Author

N84-25725# Ecole Royale Militaire, Brussels (Belgium).
AERO/THERMODYNAMIC AND ACOUSTIC CONSIDERATIONS IN THE DESIGN OF TEST-BEDS FOR TURBOJETS AND TURBOFANS
Rene Jacques *In* AGARD Operational and Performance Meas. on Eng. in Sea Level Test Facilities Mar. 1984 23p refs (For primary document see N84-25723 16-09)
Avail: NTIS HC A09/MF A01

The testing of noninstalled engines or trimming of engines installed on aircraft has to be performed in closed test beds on most of the airfields. The lecture starts with a general presentation of the closed test bed and the layout of the buildings. The thermodynamic equations for the calculation of the air and waterflows needed for the cooling of the hot gases ejected by the turbojet are established. These flows are a function of the

thermodynamic performance parameters of the engine, and the maximum value of the temperature allowed by the materials used in the exhaust. Correct measurement of the thrust imposes restrictions on the aerodynamics of the flow such as speeds and depression in the test room. The required air flow enables us to determine the cross section of the test room. The choice of a test bed with one or two air intakes depends on the airflows. The aerodynamic equations must be established in order to calculate approximately the airflows through the test bed. The airflows are functions of the cross sectional areas of intake and exhaust stacks, ejector, flow loss coefficients and such engine parameters as thrust, temperatures and airflow. Noise reduction in the surrounding environment is the first aim of the test bed designer. The allowable noise level imposed by the user depends on the location and the orientation of the test cell, and the distances from residential buildings, offices or workshops. B.W.

N84-25726# Rolls-Royce Ltd., Bristol (England). Dept. of Developmental Engineering.

DEVELOPMENT TESTING: USE OF SEA LEVEL TEST BEDS AND RIGS

M. H. Beanland *In* AGARD Operational and Performance Meas. on Eng. in Sea Level Test Facilities Mar. 1984 6p (For primary document see N84-25723 16-09)

Avail: NTIS HC A09/MF A01

An in-depth description is given of the types of development programs used in the testing of jet engines in sea level test facilities. Types of development tests include: piece parts level testing; module level testing; spool level testing; full engine level testing; and integrity testing. B.W.

N84-25727# Pratt and Whitney Aircraft, West Palm Beach, Fla. Dept. of Test Instrumentation.

INSTRUMENTATION TECHNIQUES IN SEA LEVEL TEST FACILITIES

Calvin E. Cronin *In* AGARD Operational and Performance Meas. on Eng. in Sea Level Test Facilities Mar. 1984 10p refs (For primary document see N84-25723 16-09)

Avail: NTIS HC A09/MF A01

This paper describes the application of instrumentation used during testing of turbojet and turbofan engines in sea level test facilities. The operating principal of various transducer types are discussed along with errors encountered and techniques used for calibration. A brief description of systems used for data acquisition, monitoring of engine health, and ensuring safety of the engine under test is also presented. It is the intention of this paper to present general information in the application of instrumentation devices and systems for the benefit of individuals with limited experience in the field of instrumentation. It discusses some, but by no means all, of the measurement techniques practiced in the engine development process. A selection of references is provided for those interested in reading further. Author

N84-25728# National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.

PERFORMANCE DERIVATION OF TURBOJETS AND TURBOFANS FROM TESTS IN SEA-LEVEL TEST CELLS c07

D. M. Rudnitski *In* AGARD Operational and Performance Meas. on Eng. in Sea Level Test Facilities Mar. 1984 22p refs (For primary document see N84-25723 16-09)

Avail: NTIS HC A09/MF A01

To most users of aircraft jet engines, the definition of engine performance means the thrust level, and the fuel consumption required to generate it. Just as important, however, is mechanical performance, as an engine may meet the thrust requirement, yet lack sufficient mechanical integrity. The operator must therefore have some means of quantifying engine performance before he can pronounce it as healthy. This type of routine testing is generally conducted in an enclosed ground level test bed. During an engine test, data are recorded at several power settings, corrected for cell effects, and compared against manufacturer's supplied curves to determine actual performance. If an engine was tested on an outdoor stand, under zero wind conditions, the measured thrust, corrected for instrument error, would be the true engine thrust. The act of bringing the engine into an enclosed facility has an effect on measured engine performance. The procedure for quantifying this effect, sometimes called establishing a cell factor, is usually done by correlating the customer's facility to the manufacturer's standard test cell using a gold plated engine. This paper describes the types of measurements, performance parameters, and methods of data presentation for a correlation program. Author

N84-25729# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).

TESTING OF TURBOSHAFT ENGINES

M. D. Wunder *In* AGARD Operational and Performance Meas. on Eng. in Sea Level Test Facilities Mar. 1984 11p (For primary document see N84-25723 16-09)

Avail: NTIS HC A09/MF A01

Safety in flying is of paramount importance. The high standard of the theoretical principles behind research and design and quality measures during production on their own are not sufficient for guaranteeing adequate safety. Therefore testing of components and engines before installation in aircraft is still required. It may prove possible to reduce the extent of testing, based on more sophisticated evaluation methods and testing techniques. Modular designed engines may be tested even less in the future, if the effect of specific replaced modules is well understood. This lecture is concerned with engine development, manufacturing and maintenance. B.W.

N84-25730# Royal Aircraft Establishment, Farnborough (England). Test Operations Div.

DATA ACQUISITION AND PROCESSING IN SEA-LEVEL TEST BEDS c82

M. Holmes, P. G. Booker, and B. M. Watts *In* AGARD Operational and Performance Meas. on Eng. in Sea Level Test Facilities Mar. 1984 17p (For primary document see N84-25723 16-09)

Avail: NTIS HC A09/MF A01

This lecture presents an overview of modern day data acquisition display in sea level test beds, and to aid an understanding of the subject it has been conveniently divided into several sections, each of which covers a particular aspect of the overall process. Starting at the engine, or perhaps within it, a physical quantity such as pressure or temperature has to be converted into an analogue of its value and then transmitted to the control room where its value can be displayed to the test engineer as well as being recorded for later analysis. Thus the lecture first of all discusses the range of parameters that may need to be measured on a test engine and the nature of the signals which are output by the measuring devices. Next, the question of signal transmission is dealt with, and here the importance of preventing noise from degrading the transmitted signal is described. This is followed by a section on the important aspect of measurement calibration. Finally, the methods whereby signals are collected, stored and displayed are given some attention. In each section mention is made of the increasingly important role of microprocessors, particularly for data reduction, data analysis and monitoring of test data. B.W.

N84-25731# Royal Air Force, Barry (England).

UNINSTALLED AERO ENGINE TESTING IN OPERATION IN THE ROYAL AIR FORCE

J. A. Rowland, B. Scofield, C. Haynes, and C. Broad *In* AGARD Operational and Performance Meas. on Eng. in Sea Level Test Facilities Mar. 1984 19p (For primary document see N84-25723 16-09)

Avail: NTIS HC A09/MF A01

The RAF started with Avon and Spey Uninstalled Testing Run Up Stands (UTRUS) with limited scope, but soon established firm requirements for the comprehensive UETF facilities which we now have to support Adour and RB199. These have full thrust measurement and comprehensive instrumentation; various developments are described. Data analysis methods are emphasized including the use of desk top calculators and the advantages

gained from ADP and Automated Power Plant Testing (APT). CSDE's work on continuous calibration is described with examples and a brief introduction to their V mask technique. The paper concludes with a description of the RAF Training schemes for UETF Operators. Author

N84-25732# Aeronautical Research Labs., Melbourne (Australia).
DIGITAL CONTROL OF FLIGHT SIMULATOR MOTION BASE ACTUATOR
J. Sandor Jan. 1984 54 p refs
(ARL-SYS-TM-69; AR-003-006) Avail: NTIS HC A04/MF A01

Digital control strategies for a nonlinear motion base actuator are considered and a compound linear/nonlinear algorithm is derived for velocity tracking under a range of load conditions for representative moton demands. Discrete frequency domain methods are employed to synthesize the linear components of the control law and to establish the stability of the closed loop system via describing function analysis. The nonlinear compensation, providing attenuation of Coulomb friction effects, is realized through a velocity dependent gain term, which does not significantly affect the satisfactory large amplitude system response. Overall closed loop system performance is validated through computer simulation. Author

N84-25733*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MODIFICATION OF NASA LANGLEY 8 FOOT HIGH TEMPERATURE TUNNEL TO PROVIDE A UNIQUE NATIONAL RESEARCH FACILITY FOR HYPERSONIC AIR-BREATHING PROPULSION SYSTEMS
H. Neale Kelly and Allan R. Wieting May 1984 10 p refs Presented at the AIAA 13th Aerodyn. Testing Conf., San Diego, Calif., 5-7 Mar. 1984 Previously announced in IAA as A84-24190
(NASA-TM-85783; NAS 1.15:85783) Avail: NTIS HC A02/MF A01 CSCL 14B

A planned modification of the NASA Langley 8-Foot High Temperature Tunnel to make it a unique national research facility for hypersonic air-breathing propulsion systems is described, and some of the ongoing supporting research for that modification is discussed. The modification involves: (1) the addition of an oxygen-enrichment system which will allow the methane-air combustion-heated test stream to simulate air for propulsion testing; and (2) supplemental nozzles to expand the test simulation capability from the current nominal Mach number to 7.0 include Mach numbers 3.0, 4.5, and 5.0. Detailed design of the modifications is currently underway and the modified facility is scheduled to be available for tests of large scale propulsion systems by mid 1988. AIAA

N84-25734# Bristol Univ. (England). Dept. of Aeronautical Engineering.
A STUDY OF THE ACTION OF AN AIRGUN B.S. Thesis
R. P. Maddocks and M. A. Rowson Jun. 1983 43 p refs
(BU-296) Avail: NTIS HC A03/MF A01

The means by which stored spring energy is converted to pellet muzzle energy in a piston spring airgun were investigated. The flow through various transfer ports which is due to a pressure difference was examined. It served to support a model used in a computerized simulation of the firing cycle of an airgun. The computerized simulation, modelled on steady state conditions, uses the dimensions of a typical air rifle to simulate the interaction of the various elements of the gun during firing. Varying the parameters of the gun is considered and its effect on the weapon efficiency is noted. E.A.K.

N84-25735# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
THE WIND TUNNEL S2MA OF THE AERODYNAMIC TESTING PLANT IN MODENE-AVRIEUX, FRANCE [LA SOUFFLERIE S2MA DU CENTRE D'ESSAIS AERODYNAMIQUES DE MODANE-AVRIEUX]
Jean Laverre and Francois Charpin 1983 64 p In FRENCH Report will be announced as translation ESA-TT-862
(ONERA-NT-1983-5; ESA-TT-862) Avail: NTIS HC A04/MF A01

The continuous pressurized S2MA wind tunnel has a 1.75 x 1.77 sq m transonic section (Mach 0.1 to 1.3) and a 1.75 x 1.935 sq m supersonic section (Mach 1.5 to 3.1). The different supports used are described as well as an overview of the tests conducted which illustrate the possibilities offered by this facility. Instrumentation as well as data acquisition and processing are discussed. Schematics are included. A.R.H.

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-25736* National Aeronautics and Space Administration, Washington, D. C.
TECHNOLOGY FOR LARGE SPACE SYSTEMS: A BIBLIOGRAPHY WITH INDEXES
Jan. 1984 115 p refs
(NASA-SP-7046(10); NAS 1.21:7046(10)) Avail: NTIS HC $13.00 CSCL 22A

The bibliography lists 408 reports, articles and other documents introduced into the NASA scientific and technical information system to provide helpful information to the researcher, manager, and designer in technology development and mission design in the area of large space system technology. Subject matter is grouped according to systems, interactive analysis and design, structural and thermal analysis and design, structural concepts and control systems, electronics, advanced materials, assembly concepts, propulsion, and solar power satellite systems. M.A.C.

N84-25737*# National Aeronautics and Space Administration, Washington, D. C.
LIVING AND WORKING IN SPACE. A HISTORY OF SKYLAB
W. David Compton and Charles D. Benson 1983 466 p refs Original document contains color illustrations
(NASA-SP-4208; NAS 1.21:4208; LC-81-22424) Avail: NTIS MF A01; SOD HC $20.00 as 033-000-00847-3

The history of Skylab is examined with emphasis on program development from previous Apollo missions, modifications to spacecraft, onboard experiments, and flight crew training. A listing of the missions and an evaluation of results are included with a brief description of the workshop's reentry. M.A.C.

N84-25738# Army War Coll., Carlisle Barracks, Pa. Strategic Studies Inst.
BALLISTIC MISSILE DEFENSE, SPACE-BASED WEAPONS, AND THE DEFENSE OF THE WEST
D. S. Papp 15 Nov. 1983 36 p
(AD-A140280) Avail: NTIS HC A03/MF A01 CSCL 15/3

This memorandum examines the many issues related to the technical feasibility and future deterrent utility of ballistic missile defense (BMD). The author contends that BMD clearly presents American and Western security planners with a staggering number of possibilities. The author concludes, however, the uncertainties to future BMD technologies, the unknown constraints of deployment, the potential costs make acquisition decisions highly problematic. Neither proponents nor opponents of spaced-based, land-based, or layered BMD systems have presented evidence that drives one to unambiguous final conclusions. Author (GRA)

N84-26211# Air Force Geophysics Lab., Hanscom AFB, Mass.
SPACE SYSTEMS ENVIRONMENTAL INTERACTIONS TECHNOLOGY PROGRAM
C. P. Pike, D. A. Guidice, R. A. Davis, A. L. Chesley, W. N. Hall, and B. M. Shuman *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 391-398 (For primary document see N84-26185 16-46)
(AD-P002125) Avail: NTIS HC A18/MF A01 CSCL 22/1

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N84-25739# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EQUIPMENT FOR MEASURING THE DISTANCE OF SATELLITE IN LOW ORBIT [DESCRICAO DE UM EQUIPAMENTO PARA MEDIDA DE DISTANCIA DE SATELITES DE ORBITA BAIXA]
Celso Macedo deAndrade May 1984 17 p refs In PORTUGUESE; ENGLISH summary Presented at the 36th Reuniao Anual da SBPC, Sao Paulo, Brazil, 4-11 Jul. 1984
(INPE-3126-PRE/517) Avail: NTIS HC A02/MF A01

A ranging baseband equipment for utilization in low altitude satellite orbit is described. The equipment is a prototype which measures range up to 3,750 km with a resolution of 4 m and precision which is a function of the signal to noise ratio of the ranging signal. E.A.K.

N84-25740# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
NUMERICAL ORBIT GENERATORS OF ARTIFICIAL EARTH SATELLITES [GERADOR NUMERICO DE ORBITAS DE SATELITES ARTIFICIAIS TERRESTRES]
Helio Koiti Kugar and Wilson Custodio Canesin daSilva Apr. 1984 91 p refs In PORTUGUESE; ENGLISH summary
(INPE-3050-RPE/455) Avail: NTIS HC A05/MF A01

A numerical orbit integrator containing updatings and improvements relative to the previous ones that are being utilized by the Departmento de Mecanica Espacial e Controle (DMC), of INPE, besides incorporating newer modellings resulting from the skill acquired along the time is presented. Flexibility and modularity were taken into account in order to allow future extensions and modifications. Characteristics of numerical accuracy, processing quickness, memory saving as well as utilization aspects were also considered. User's handbook, whole program listing and qualitative analysis of accuracy, processing time and orbit perturbation effects were included as well. Author

N84-25741# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
ORBIT MANEUVERS WITH FINITE THRUST
9 Jun. 1983 136 p
(MBB-UR-654-83-O) Avail: NTIS HC A07/MF A01

A reference catalog is described that discusses finite thrust as it effects orbital mechanics. The influence of propellant consumption, engine types, thrust levels, and exhaust velocities on orbit maneuvers is examined. A variety of optimization methods are included. M.A.C.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N84-25742# Range Commanders Council, White Sands Missile Range, N. Mex. Documentation Group.
UNIVERSAL DOCUMENTATION SYSTEM HANDBOOK - AN INTRODUCTION OF THE UNIVERSAL DOCUMENTATION SYSTEM
1984 16 p
(AD-A140140; RCC/DG-501-84) Avail: NTIS HC A02/MF A01 CSCL 05/1

The Range Commanders Council (RCC) Documentation Group has developed a Universal Documentation System (UDS) for the purpose of creating better communications between interacting agencies. The UDS endeavors to standardize the efforts of all agencies who seek support in conducting operations on the various ranges. The following graphic illustrations have been prepared for the purpose of familiarizing potential range users with the UDS, which has been published as RCC Document 401. An overview of the system, including descriptions of the various levels of documentation, system flexibility/options and general user guidelines has been included. The UDS is a comprehensive tool which can be used by all. Author (GRA)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-25743# Howard Univ., Washington, D. C.
AERODYNAMICS OF SOUNDING ROCKETS AT SUPERSONIC SPEEDS Ph.D. Thesis
Narendra R. Vira 1982 242 p
Avail: Univ. Microfilms Order No. DA8404774

This dissertation presents a practical and low cost method of computing the aerodynamic characteristics of vehicles such as sounding rockets, high speed bombs, projectiles and guided missiles in supersonic flight. The vehicle configuration consists of a slender axisymmetric body with a conical or ogive noise, cylinders, shoulders and boattails, if any, and have sets of two, three or four fins. Geometry of the fin cross section can be single wedge, double wedge, modified single wedge or modified double wedge. First the aerodynamics of the fins and the body are analyzed separately; then fin body and fore and aft fin interferences are accounted for when they are combined to form the total vehicle. Results and formulas documented in this work are the basis of the supersonic portion of the Theoretical Aerodynamic Derivatives (TAD) computer program operating at the NASA Goddard Space Flight Center. Dissert. Abstr.

N84-25744 Institut d'Aeronomie Spatiale de Belgique, Brussels.
SUMMARY OF 25 YEARS OF SPACECRAFT LAUNCHING [BILAN DE 25 ANNEES DE LANCEMENTS SPATIAUX]
J. Vercheval 1983 280 p In FRENCH; ENGLISH summary
(Aeronomica-Acta-A-34-1983) Avail: Issuing Activity

Successful satellite launchings until 31 December 1981 are summarized. A table of all satellites with their initial orbital characteristics is then given in alphabetical order, followed by a brief description of the missions for the various types of satellites and the chronology of manned space flights. R.J.F.

N84-25745*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE PROCESSING APPLICATIONS ROCKET PROJECT. SPAR 8 Final Report
Roger P. Chassay, ed. Jun. 1984 229 p refs
(NASA-TM-82578; NAS 1.15:82578) Avail: NTIS HC A11/MF A01 CSCL 12A

The Space Processing Applications Rocket Project (SPAR) VIII Final Report contains the engineering report prepared at the Marshall Space Flight Center (MSFC) as well as the three reports from the principal investigators. These reports also describe pertinent portions of ground-based research leading to the ultimate selection of the flight sample composition, including design, fabrication, and testing, all of which are expected to contribute immeasurably to an improved comprehension of materials processing in space. This technical memorandum is directed entirely to the payload manifest flown in the eighth of a series of SPAR flights conducted at the White Sands Missile Range (WSMR) and includes the experiments entitled Glass Formation Experiment SPAR 74-42/1R, Glass Fining Experiment in Low-Gravity SPAR 77-13/1, and Dynamics of Liquid Bubbles SPAR Experiment 77-18/2. B.W.

N84-25746# European Space Agency, Paris (France).
ARIANE V8 - INTELSAT V F8 [ARIANE V8 - INTELSAT V F8]
1983 68 p In FRENCH Prepared in cooperation with CNES, Paris
Avail: NTIS HC A04/MF A01

The operating plan, launch schedule, and flight plan are given for launching the INTELSAT V-8 satellite into a geostationary transfer orbit by an Ariane launch vehicle. The principal characteristics of the nominal trajectory, specifications relative to the launching base, and safety management are discussed. General information is included on the development and production of the first and subsequent Ariane launch vehicles. The Guyana space center and launching sites are described as well as the capabilities and components of the INTELSAT 5 series satellites. A.R.H.

N84-25747# Aeritalia S.p.A., Torino (Italy). Space Sector
STUDY OF ERS-1 DYNAMIC INTERACTION. VOLUME 1: THEORETICAL NOTES Final Report
G. Corrado and M. Dumontel Paris ESA Dec. 1982 116 p refs
(Contract ESA-4759/81/NL-PP(SC))
(ER-RP-A1-002-Vol-1; ESA-CR(P)-1849-Vol-1) Avail: NTIS HC A06/MF A01

Through the use of a reduced mathematical model, a preliminary analysis and performance assessment of the ERS-1 control system is described. The derivation of the simulation model and the associated software, important simulation results, and additional investigations to support the analysis are presented. M.A.C.

N84-25748# Filtronic Components Ltd., Leeds (England).
STUDY OF IN-ORBIT TEST TECHNIQUES FOR MULTIBEAM SATELLITES Final Report
L. Lundquist and R. A. Gough (Communication Systems Research, Ltd., Ilkley, England) Paris ESA Apr. 1983 108 p refs
(Contract ESTEC-4418/80/NL-DG(SC))
(LL3-17) Avail: NTIS HC A06/MF A01

Different approaches to the in orbit acceptance testing of a multibeam satellite are examined. The emphasis is on operational systems, and for guidance the system concept of the Advanced Multi-Beam On-Board-Switching (AMOS) satellite is used. For each cell there is an uplink beam and a downlink beam. All uplink beams are connected to the input side of a switch matrix, and all downlink beams are connected to the output side of the same switch matrix. The ability to connect every downlink beam to every uplink beam is available. M.A.C.

N84-25749# European Space Agency, Paris (France).
FREE MOLECULAR AERODYNAMICS FOR SATELLITE APPLICATION
Georg Koppenwallner Jul. 1983 149 p refs Transl. into ENGLISH of "Freimolekulare Aerodynamik fuer Satellitenanwendung" rept. DFVLR-FB-82-08 DFVLR, Goettingen, West Germany, Jan. 1982 (ESA-TT-776; DFVLR-FB-82-08) Avail: NTIS HC A07/MF A02; Original German report available from DFVLR, Cologne, DM 38

The aerodynamic actions on satellites in earth orbit are discussed. To establish the problems involved, a short summary of typical satellite geometries and the upper atmosphere's flow properties is given. Satellites are exposed to a free molecular flow of a gas mixture, the freestream molecular Mach number of the different components varying, according to molecular weight, between S sub infinity approximately equals 3 and 20. As the flow is free molecular, each species develops its own independent flow field. Only one component of a mixture is considered. The free molecular flow theory is stated both for convex and concave structural elements of a satellite. For both cases the physical and theoretical flow behavior is investigated, and simplified solutions for limiting cases are developed. In addition, the resultant aerodynamic coefficients are calculated by exact and approximate methods for typical bodies and body elements. R.J.F.

N84-25750# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE ADVISABILITY OF COMPETITIVE INTERNATIONAL SATELLITES M.S. Thesis
D. I. Greenhalgh 1984 98 p
(AD-A140188; AFIT/CI/NR-84-1T) Avail: NTIS HC A05/MF A01 CSCL 22/2

This analysis examines the legal, political, and economic issues raised by the applications of Orion Satellites Corporation and International Satellite, Inc., before the Federal Communications Commission. The proposals request approval for the establishment of communications satellite systems potentially competitive with the International Telecommunications Satellite Organization (INTELSAT), a consortium of 109 member nations, which currently maintains a monopoly of international communications satellite traffic. The breadth of consequences resulting from a positive FCC action warrants a close scrutiny of U.S. international foreign policy objectives. Author (GRA)

N84-25751# Army Missile Command, Redstone Arsenal, Ala. Guidance and Control Directorate.
A PRELIMINARY INVESTIGATION ON THE APPLICATION OF ROBOTICS TO MISSILE FIRE CONTROL
P. H. McIngvale, A. D. Sherrill, and J. W. Herring Nov. 1983 31 p
(AD-A140369; AD-E950519; DRSMI/RG-84-8-TR) Avail: NTIS HC A03/MF A01 CSCL 06/4

This report explores the possible applications of artificial intelligence and robotics to Army fire control problems. A candidate robotics system is presented and its development is detailed. The system is a ground Remote Target Acquisition/Designation System which would be developed in stages and would make use of technology existing in HELLFIRE, FOG-M, and other related systems. It is intended to evolve from a relatively simple surveillance and designation system to an essentially autonomous fire control system. It has the advantages of removing the soldier to a less hazardous position, allowing the operator(s) to oversee the operation of many robotic forward observers, and allowing the acquisition and designation of many robotic forward observers, and allowing the acquisition and designation of targets over a wide area. In the latter evolutionary stages, the system should be equipped with weapons and be autonomous or semi-autonomous. Author (GRA)

N84-25657# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Directorate of Space Transportation Systems.
THE ESA ACTIVITIES ON FUTURE LAUNCHERS
H. Pfeffer *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1984 23 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01

N84-26196# Air Force Geophysics Lab., Hanscom AFB, Mass.
ENVIRONMENTAL INTERACTIONS OF POLAR ORBITING SATELLITES
W. J. Burke *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 163-173 refs (For primary document see N84-26185 16-46)
(AD-P002110) Avail: NTIS HC A18/MF A01 CSCL 22/2

N84-26198# University Coll., London (England). Dept. of Physics and Astronomy.
OBSERVATIONS OF DIFFERENTIAL CHARGING WITH METEOSAT
A. D. Johnstone and G. L. Wrenn *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 185-195 refs (For primary document see N84-26185 16-46)
(AD-P002112) Avail: NTIS HC A18/MF A01 CSCL 20/3

N84-26432 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
MAGNETIC ROLL/YAW ATTITUDE CONTROL OF A MOMENTUM BIASED NEAR POLAR ORBIT SATELLITE
E. Bruederle and A. Reindler *In its* Tech. and Sci. Publ. 1983 1983 p 19-28 refs Presented at 9th IFAC/ESA Symp. on

Automatic Control in Space 1982, Noordwijkerhout, Netherlands, 5-9 Jul. 1982 (For primary document see N84-26430 16-81)
(MBB-UR-629-83-O) Avail: Issuing Activity

N84-26443 Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
A REVIEW OF THE IN-ORBIT THERMAL PERFORMANCE OF MARITIME COMMUNICATIONS SATELLITE (MCS)-A
D. Chalmers *In* MBB Tech. and Sci. Publ. 1983 1983 p 233-243 refs Presented at AIAA 18th Thermophys. Conf., Montreal, 1-3 Jun. 1983 (For primary document see N84-26430 16-81)
(MBB-UR-641-83-O) Avail: Issuing Activity

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N84-25752*# Chrysler Corp., New Orleans, La. Structures and Mechanics Dept.
WATER IMPACT TEST OF AFT SKIRT END RING, AND MID RING SEGMENTS OF THE SPACE SHUTTLE SOLID ROCKET BOOSTER
Sep. 1983 242 p refs
(Contract NAS8-35017)
(NASA-CR-171027; NAS 1.26:171027; TN-SM-83-13) Avail: NTIS HC A11/MF A01 CSCL 22B

The results of water impact loads tests using aft skirt end ring, and mid ring segments of the Space Shuttle Solid Rocket Booster (SRB) are examined. Dynamic structural response data is developed and an evaluation of the model in various configurations is presented. Impact velocities are determined for the SRB with the larger main chute system. Various failure modes are also investigated. M.A.C.

N84-25753*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ON-ORBIT CRYOGENIC FLUID TRANSFER
John C. Aydelott, John P. Gille (Martin Marietta Aerospace, Denver), and Ralph N. Eberhardt (Martin Marietta Aerospace, Denver) 1984 11 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984; sponsored by the AIAA, SAE and ASME
(NASA-TM-83688; E-2139; NAS 1.15:83688; AIAA-84-1343) Avail: NTIS HC A02/MMF A01 CSCL 20D

A number of future NASA and DOD missions have been identified that will require, or could benefit from resupply of cryogenic liquids in orbit. The most promising approach for accomplishing cryogenic fluid transfer in the weightlessness environment of space is to use the thermodynamic filling technique. This approach involves initially reducing the receiver tank temperature by using several charge hold vent cycles followed by filling the tank without venting. Martin Marietta Denver Aerospace, under contract to the NASA Lewis Research Center, is currently developing analytical models to describe the on orbit cryogenic fluid transfer process. A detailed design of a shuttle attached experimental facility, which will provide the data necessary to verify the analytical models, is also being performed. Author

N84-25754# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
AEROTHERMAL WIND TUNNEL TEST OF THE SPACE SHUTTLE OMS (ORBITAL MANEUVERING SYSTEM) POD AFRSI (ADVANCED FLEXIBLE REUSABLE SURFACE INSULATION) MATERIAL Final Report, 27 May - 11 Aug. 1983
S. A. Stepanek AEDC Sep. 1983 72 p Sponsored by Air Force
(AD-A140292; AEDC-TSR-83-V29) Avail: NTIS HC A04/MF A01 CSCL 22/2

Wind tunnel tests on Advanced Flexible Reusable Surface Insulation used to protect the Orbital Maneuvering System Pod of the Space Shuttle Orbiter were performed in the von Karman Gas Dynamics Facility Aerothermal Wind Tunnel (C). A wedge was used to subject the AFRSI to the desired local flow conditions in a free stream Mach 4 flow with the objective of duplicating the AFRSI material failure that occurred during the STS-6 flight. Selected results are presented to illustrate the test techniques and typical data obtained. Author (GRA)

N84-25755# Old Dominion Univ., Norfolk, Va.
ON THE SPACE SHUTTLE WING THERMAL-STRUCTURAL ANALYSIS Ph.D. Thesis
Kumar Krishna Tamma 1983 184 p
Avail: Univ. Microfilms Order No. DA8404352

A finite element approach for efficient thermal structural analysis of structures with thermal protection systems (TPS) is described. The approach is applied to Space Shuttle wing structure configurations subjected to reentry heating. New two and three dimensional finite elements are developed to model heat transfer in the TPS and supporting structure. A typical TPS/Structural element predicts transient nonlinear temperature variations through the TPS thickness and detailed structural temperatures at the TPS/Structure interface. The accuracy of the TPS/Structure approach in two and three dimensions is evaluated by comparisons with the conventional approach for various configurations of the wing structure. The results indicate that the approach predicts detailed structural temperature distributions with significant reduction in model size and computer time. The approach offers potential for extension to more complex two and three dimensional structures. Dissert. Abstr.

N84-25659*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SHUTTLE FLIGHT DATA ANALYSIS
Gerald D. Walberg *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1984 67 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01 CSCL 22B

N84-26190*# Utah State Univ., Logan.
SPACE SHUTTLE CHARGING RESULTS
W. J. Raitt *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 107-118 (For primary document see N84-26185 16-46)
(Contract NAS5-24455)
(AD-P002104) Avail: NTIS HC A18/MF A01 CSCL 20C

N84-26442 Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
THE THERMAL DESIGN OF THE EUROPEAN COMPLEMENT OF FIRST SPACELAB MISSION (FSLP)
U. Laux *In* MBB Tech. and Sci. Publ. 1983 1983 p 221-231 refs Presented at 13th Intersoc. Conf. on Environ. Systems, San Francisco, 11-13 Jul. 1983 (For primary document see N84-26430 16-81)
(MBB-UR-645-83-O; SAE-TPS-831144) Avail: Issuing Activity

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N84-25756*# San Jose State Univ., Calif. Dept. of Electrical Engineering.
APPLICATION OF SURFACE ACOUSTIC WAVE DEVICES TO RADIO TELEMETRY Final Report, 1 Jan. 1981 - 15 Dec. 1983
Udo Strasilla 1983 108 p refs
(Grant NAG2-85)
(NASA-CR-173597; NAS 1.26:173597) Avail: NTIS

HC A06/MF A01 CSCL 09F

Three experimental Surface Acoustic Wave Resonators (SAWR) are developed and evaluated. A desired center frequency is obtained by correct spacing of the Inter-Digital Transducers (IDT). Transmitting and receiving IDT's must be close for adequate coupling and a sufficient number of reflectors are required to create a high quality standing wave. A review of oscillator theory is given and current technology evaluated. M.A.C.

N84-25894*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
EFFECTS OF NRZ-M MODULATION ON CONVOLUTIONAL CODES PERFORMANCE
L. J. Deutsch, F. Pollara, and L. Swanson *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 33-40 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 09F

N84-25901*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Telecommunications Systems Section.
EFFECT OF RF FILTERING ON THE PERFORMANCE OF UNCODED PCM/PM TELEMETRY CHANNELS
M. A. Koerner *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 104-125 ref (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 09F

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-25757# Goodyear Aerospace Corp., Akron, Ohio.
INNOVATIVE STRUCTURES FOR SPACE APPLICATIONS
Oct. 1982 54 p refs
(GAC19-1563) Avail: NTIS HC A04/MF A01

Expandable/flexible/rigidized structures are compatible with the space environment for both manned and unmanned applications. Materials for use in the Spacelab transfer tunnel are tested. This effort includes flammability, off/gassing, tensile, peel adhesion, lap joint strength, vacuum debond, and permeability tests. Material specimens are fabricated and tested to determine the effect of cut fill yarns, cyclic loading, cure/post cure, and vacuum bakeoff on strip tensile strength and peel adhesion. Several light weight, wire grid rigidized spheres are discussed. M.A.C.

N84-25758*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DYNAMIC CHARACTERISTICS OF A SPACE-STATION SOLAR WING ARRAY
John T. Dorsey and Harold G. Bush Jun. 1984 32 p refs
(NASA-TM-85780; L-15752; NAS 1.15:85780) Avail: NTIS HC A03/MF A01 CSCL 22B

A solar-wing-array concept is described which meets space-station requirements for minimum fundamental frequency (0.4 Hz), component modularity, and growth potential. The basic wing-array design parameters are varied, and the resulting effects on the array vibration frequencies and mode shapes are assessed. The transient response of a free-free space station (incorporating a solar-wing-array point design) to a load applied at the space-station center is studied. The use of the transient response studies in identifying critically loaded structural members is briefly discussed. The final 150-kW space-station configuration has a fundamental elastic frequency of 0.403 Hz. Author

N84-25759# Societe Nationale Industrielle Aerospatiale, Saint-Medard-en-Jalles (France).
MULTIDIRECTIONAL COMPOSITES IN BALLISTIC AND AEROSPACE VEHICLES [LES COMPOSITES MULTIDIRECTIONNELS DANS LES VEHICULES BALISTIQUES ET SPATIAUX]
Yves Grenie 1984 25 p In FRENCH
(SNIAS-832-430-102) Avail: NTIS HC A02/MF A01

Of all the ballistic and aerospace vehicles, reentry bodies are most subjected to thermomechanical constraints. The use of three dimensional composites is justified with emphasis on heat shielding, antenna apertures, and blast pipes. Principles are given for automatically weaving three dimensional composites, for fabricating and densifying silica-resin ceramic composites, and for producing carbon-carbon composites. Impregnation, low pressure carbonization, hot isostatic pressing at 1,000 C and graphitization at 3,000 C are discussed. Transl. by A.R.H.

N84-25760# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
COMPONENTS SELECTION, PROCUREMENT AND CONTROL FOR ESA SPACECRAFT AND ASSOCIATED EQUIPMENT
Apr. 1981 25 p
(ESA-PSS-01-60-Issue-1; ISSN-0379-4059) Avail: NTIS HC A02/MF A01

This specification establishes the requirements for a component selection, procurement and control program applicable to projects of the European Space Agency (ESA) and is to be applied by contractors and subcontractors to ESA spacecraft and associated equipment in which the use of components with specific reliability and quality requirements is mandatory. Author

N84-25761# JAYCOR, San Diego, Calif.
LITERATURE REVIEW OF SPACECRAFT CHARGING
R. Leadon and M. Treadway 20 Oct. 1983 49 p
(Contract F19628-83-C-0147; AF Proj. 7661)
(AD-A140543; JAYCOR-J200-83-635/2322; AFGL-TR-83-0294)
Avail: NTIS HC A03/MF A01 CSCL 22/2

A literature review has been performed on spacecraft electrical anomalies, arc discharges on spacecraft and laboratory simulations of spacecraft materials, and measurements of electrical transients on spacecraft. Analyses in the literature of the probable causes of the observed anomalies are summarized along with the data on measured electrical transients on operating spacecraft. An arc type is tentatively selected for further laboratory investigations of its radiated RF and other characteristics. A brief description of the proposed test plan is given. Author (GRA)

N84-25658*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE NEXT GENERATION OF REENTRY VEHICLES: NASA'S VIEW
Gerald D. Walberg *In* Von Karman Inst. for Fluid Dynamics Hypersonic Aerothermodyn. 1984 95 p refs (For primary document see N84-25656 16-02)
Avail: NTIS HC A25/MF A01 CSCL 22B

N84-26194# Air Force Geophysics Lab., Hanscom AFB, Mass.
THE WORST CASE CHARGING ENVIRONMENT
D. A. Hardy *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 141-155 (For primary document see N84-26185 16-46)
(AD-P002108) Avail: NTIS HC A18/MF A01 CSCL 20/3

N84-26197# European Space Technology Center, Noordwijk (Netherlands). Space Sciences Dept.
INTERACTIONS BETWEEN A LARGE BODY AND ITS ENVIRONMENT IN A LOW POLAR ORBIT
R. Grard, K. Knott, and A. Pedersen *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 175-184 refs (For primary document see N84-26185 16-46)
(AD-P002111) Avail: NTIS HC A18/MF A01 CSCL 20/3

N84-26200# IRT Corp., San Diego, Calif.
SPACE ELECTRON-INDUCED DISCHARGE COUPLING INTO SATELLITE ELECTRONICS
J. Wilkenfeld *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 215-234 refs (For primary document see N84-26185 16-46)
(AD-P002114) Avail: NTIS HC A18/MF A01 CSCL 20/3

N84-26202# Air Force Geophysics Lab., Hanscom AFB, Mass.
SHUTTLE ORBITER CHARGING IN POLAR EARTH ORBIT
A. G. Rubin and A. L. Besse *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 253-263 refs (For primary document see N84-26185 16-46)
(AD-P002116) Avail: NTIS HC A18/MF A01 CSCL 20/3

N84-26203# Air Force Geophysics Lab., Hanscom AFB, Mass.
POTENTIAL BARRIERS AND MULTIPLE ROOTS IN SPACECRAFT CHARGING
A. L. Besse *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 267-276 refs (For primary document see N84-26185 16-46)
(AD-P002117) Avail: NTIS HC A18/MF A01 CSCL 20/3

N84-26206# York Univ., Downsview (Ontario). Center for Research in Experimental Space Sciences.
THE THRESHOLD TEMPERATURE EFFECT IN HIGH-VOLTAGE SPACECRAFT CHARGING
J. G. Laframboise and M. Kamitsuma *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 293-308 refs (For primary document see N84-26185 16-46)
(AD-P002120) Avail: NTIS HC A18/MF A01 CSCL 20/3

N84-26212# Aerospace Corp., Los Angeles, Calif. Space Sciences Lab.
SUMMARY OF EXPERIMENTAL RESULTS
J. F. Fennell *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 399-405 (For primary document see N84-26185 16-46)
(Contract F04701-82-C-0083)
(AD-P002126) Avail: NTIS HC A18/MF A01 CSCL 20/3

N84-26213# Air Force Geophysics Lab., Hanscom AFB, Mass.
QUESTIONS THAT NEED TO BE ANSWERED
H. A. Cohan *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 403-405 (For primary document see N84-26185 16-46)
(AD-P002127) Avail: NTIS HC A18/MF A01 CSCL 20/3

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-25762*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROPULSION ISSUES FOR ADVANCED ORBIT TRANSFER VEHICLES
Larry P. Cooper 1984 21 p refs Presented at the JANNAF Propulsion Meeting, New Orleans, 6-9 Feb. 1984
(NASA-TM-83624; E-2058; NAS 1.15:83624) Avail: NTIS HC A02/MF A01 CSCL 21H

Studies of the United States Space Transportation System show that in the mid to late 1990s expanded capabilities for orbital transfer vehicles (OTV) will be needed to meet increased payload requirements for transporting materials and possibly men to geosynchronous orbit. Discussion and observations relative to the propulsion system issues of space basing, aeroassist compatibility, man ratability and enhanced payload delivery capability are presented. These issues will require resolution prior to the development of a propulsion system for the advanced OTV. The NASA program in support of advanced propulsion for an OTV is briefly described along with conceptual engine design characteristics. Author

N84-25763# National Aerospace Lab., Tokyo (Japan).
A STUDY OF LIQUID HYDROGEN COOLED LO2/LH2 ROCKET COMBUSTOR WITH CHANNEL WALL CONSTRUCTION
M. Niino, A. Kumakawa, N. Yatsuyanagi, H. Gomi, A. Suzuki, H. Sakamoto, M. Sasaki, and K. Yanagawa Jul. 1983 27 p refs In JAPANESE; ENGLISH summary
(NAL-TR-767; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

This is the final report on A Study of Liquid Hydrogen Cooled LO2/LH2 Rocket Combustor which has been conducted as a NAL-NASDA joint research program since 1977. Heretofore, an experimental investigation was conducted to determine the cooling characteristics of LH2 and combustion efficiency characteristics by using a sub-sized combustor with channel wall construction. In this report thermo-hydraulic behavior of the coolant in the channels of the combustor was investigaged by using an improved combustor. The following conclusions are based on studies of two combustors: (1) liquid hydrogen heat transfer correlations including the asymmetric heating effects were derived. These empirical equations were able to predict over 95% of all the present experimental data within + or 20% errors; (2) the correlation for the characteristic velocity efficiency was empirically derived. The equation succeeded in correlating all data within + or - 2% errors. To verify the usefulness of these results, the relationships between the present subsized combustors and the full-sized LES-5 engine, were discussed. Author

N84-25764*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPACE STATION PROPULSION ANALYSIS STUDY
R. M. Donovan, J. S. Sovey, and N. B. Hannum 1984 15 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984
(NASA-TM-83715; E-2180; NAS 1.15:83715; AIAA-84-1326) Avail: NTIS HC A02/MF A01 CSCL 21H

This paper summarizes the impacts on the weight, volume and power usage of a manned space station and its 90-day resupply for three integrated, auxiliary propulsion subsystems. The study was performed in coordination with activities of the Space Staton Concept Development Group (CDG). The study focused on three space station propulsion high-low thrust options that make use of fluids that will be available on the manned space station. Specific uses of carbon dioxide, water and cryogen boiloff were considered. For each of the options the increase in station hardware mass and volume to accommodate the dual thrust option is offset by the resupply savings, relative to the reference hydrazine system, after one to several resupplies. Over the life of the station the savings in cost of logistics could be substantial. The three options are examples of alternative technology paths that, because of the opportunity they provide for integration with the environmental control life support system (ECLSS) and OTV propellant storage systems, may reduce the scarring which is required on the early

station to meet the increasing propulsion requirements of the growth station. Author

N84-25765# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Analysis Lab.
LGM-30B, STAGE 2 DISSECTED MOTOR TEST REPORT Semiannual Test Results Report
E. M. Dalaba Feb. 1984 220 p
(AD-A140337; MANPA-496(84)) Avail: NTIS HC A10/MF A01 CSCL 21/8

Data analysis in this report is the culmination of testing on three dissected motors, as well as two test periods for a fourth dissected motor. In order to relate the newest dissected motor to previously dissected motors, an analysis of covariance was performed. The new data was subjected to a determination of significance of means and variance. Regressions of individual motor trends for many parameters are included in this report. Although these individual regressions do show some significant trends, it does not appear that age-out is imminent. Author (GRA)

N84-26444 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
STATUS AND FUTURE APPLICATION OF THE RF-PROPULSION SYSTEMS RITA INCLUDING INTERPLANETARY MISSIONS
H. Bassner and H. W. Loeb (Giessen Univ., West Germany) *In its* Tech. and Sci. Publ. 1983 1983 p 245-257 refs Presented at 34th IAF Congr., Budapest, 9-15 Oct. 1983 Original language document announced as A84-11805 (For primary document see N84-26430 16-81)
(MBB-UR-646-83-O) Avail: Issuing Activity

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N84-25766*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRIBOLOGICAL APPLICATIONS OF SURFACE ANALYSIS
Donald R. Wheeler 1984 16 p refs Presented at TSEM, Philadelphia, 15-20 Apr. 1984
(NASA-TM-83707; E-2166; NAS 1.15:83707) Avail: NTIS HC A02/MF A01 CSCL 07D

For some years, surface analysis was used in fundamental studies of solid-solid contacts existing in tribological systems. Analysis was used to detect material transfer in sliding contacts. The effects of surface films on the adhesion of contacts was monitored. Finally electron spectroscopic analysis of interfaces has shed some light on the fundamental electronic nature of the interfacial bond. More recently, surface analysis was applied to many tribological engineering problems. In particular, identification of chemical films formed during the sliding contact of lubricated systems and study of the surface chemistry of lubricant additives were active areas of research. One or more of four properties of the analytical technique will be important in determining its utility. The four are: lateral resolution, specimen damage, depth resolution and the availability of chemical information. In each of the applications discussed here, the important factors are brought out. Author

24 COMPOSITE MATERIALS

Includes laminates.

N84-25767*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Engineering Science and Mechanics.
TEMPERATURE DEPENDENCE OF ELASTIC AND STRENGTH PROPERTIES OF T300/5208 GRAPHITE-EPOXY
Scott Milan Milkovich and Carl T. Herakovich Apr. 1984 43 p refs
(Grant NAG1-343)
(NASA-CR-173616; NAS 1.26:173616; VPI-E-83-9; CCMS-84-03) Avail: NTIS HC A03/MF A01 CSCL 11D

Experimental results are presented for the elastic and strength properties of T300/5208 graphite-epoxy at room temperature, 116K (-250 F), and 394K (+250 F). Results are presented for unidirectional 0, 90, and 45 degree laminates, and + or - 30, + or - 45, and + or - 60 degree angle-ply laminates. The stress-strain behavior of the 0 and 90 degree laminates is essentially linear for all three temperatures and that the stress-strain behavior of all other laminates is linear at 116K. A second-order curve provides the best fit for the temperature is linear at 116K. A second-order curve provides the best fit for the temperature dependence of the elastic modulus of all laminates and for the principal shear modulus. Poisson's ratio appears to vary linearly with temperature. all moduli decrease with increasing temperature except for E (sub 1) which exhibits a small increase. The strength temperature dependence is also quadratic for all laminates except the 0 degree - laminate which exhibits linear temperature dependence. In many cases the temperature dependence of properties is nearly linear. Author

N84-25768*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
RESIDUAL STRESSES IN CROSS-PLY COMPOSITE TUBES Interim Report
David Cohen and M. W. Hyer 1 Apr. 1984 106 p refs
(Grant NAG1-343)
(NASA-CR-173540; NAS 1.26:173540; CCMS-84-04; VPI-E-84-16; IR-42) Avail: NTIS HC A06/MF A01 CSCL 11D

The residual thermal stresses in 4-layer cross-ply tubes are studied. The tubes considered has a small radius to wall-thickness ratios and so elasticity solutions were used. The residual thermal stress problem was considered to be axisymmetric and three elasticity solutions were derived and the results compared with the results using classical lamination theory. The comparison illustrates the limitations of classical lamination theory. The three elasticity solutions derived were: plane stress, plane strain, and generalized plane strain, the latter being the most realistic. Residual stresses in both the hoop and axial direction is significant. Stacking arrangement effects the residual stress to some extent, as do the material properties of the individual lamina. The benefits of hybrid construction are briefly discussed. Author

N84-25769*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE RADIATION EFFECTS ON GRAPHITE-EPOXY COMPOSITE MATERIALS Interim Report
Scott Milan Milkovich (Virginia Polytechnic Institute and State Univ., Blacksburg), Carl T. Herakovich (Virginia Polytechnic and State Univ., Blacksburg), and George F. Sykes, Jr. Blacksburg, Va. Virginia Polytechnic Institute and State Univ. Jun. 1984 176 p refs
(Grant NAG1-343)
(NASA-TM-85478; NAS 1.15:85478; CCMS-84-08; VPI-E-84-20; IR-45) Avail: NTIS HC A09/MF A01 CSCL 11D

Radiation effects on engineering properties, dimensional stability, and chemistry on state of the art composite systems were characterized. T300/934 graphite-epoxy composite was subjected to 1.0 MeV electron radiation for a total dose of 1.0 x 10(10) rads at a rate of 5.0 x 10(7) rads/hour. This simulates a worst case exposure equivalent to 30 years in space. Mechanical testing was performed on he 4-ply unidirectional laminates over the temperature range of -250 F (116K) to +250 F (394K). A complete set of in-plane tensile elastic and strength properties were obtained (E sub 1, E sub 2, nu sub 12, G sub 12, X sub T, Y sub T, and S). In addition electron microscopy was used to study and analyze the fracture surfaces of all specimens tested. Results indicate that little difference in properties is noted at room temperature, but significant differences are observed at both low and elevated temperatures. Author

N84-25770*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DYNAMIC STRESS ANALYSIS OF SMOOTH AND NOTCHED FIBER COMPOSITE FLEXURAL SPECIMENS

P. L. N. Murthy and C. C. Chamis 1984 27 p refs Presented at the 7th Conf. on Composite Mater.: Testing and Design, Philadelphia, 2-5 Apr. 1984; sponsored by the American Society for Testing and Materials

(NASA-TM-83694; E-2152; NAS 1.15:83694) Avail: NTIS HC A03/MF A01 CSCL 11D

A detailed analysis of the dynamic stress field in smooth and notched fiber composite (Charpy-type) specimens is reported in this paper. The analysis is performed with the aid of the direct transient response analysis solution sequence of MSC/NASTRAN. Three unidirectional composites were chosen for the study. They are S-Glass/Epoxy, Kevlar/Epoxy and T-300/Epoxy composite systems. The specimens are subjected to an impact load which is modeled as a triangular impulse with a maximum of 2000 lb and a duration of 1 ms. The results are compared with those of static analysis of the specimens subjected to a peak load of 2000 lb. For the geometry and type of materials studied, the static analysis results gave close conservative estimates for the dynamic stresses. Another interesting inference from the study is that the impact induced effects are felt by S-Glass/Epoxy specimens sooner than Kevlar/Epoxy or T-300/Epoxy specimens. Author

N84-25771# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Div. Avions.

PREDICTING THE DELAMINATION OF A MULTISTAGE COMPOSITE [PREVISION DU DELAMINAGE D'UN COMPOSITE MULTICOUCHE]

Gerard Bernhart and Jean-Marc Thomas 23 Feb. 1984 37 p refs In FRENCH; ENGLISH summary Presented at 3rd Gamni Intern. Congr. on Meth. Numer. de l'Ingenieur, Paris, Mar. 1983

(SNIAS-832-111-102) Avail: NTIS HC A03/MF A01

A method is presented for computing interlaminar constraints. A symmetrical composite plate in uniaxial traction is mathematically modeled, based on an elastic anaiysis, layer by layer. The interlaminar constraints are computed by minimizing the total potential energy (Ritz method) and then using an analytic substitution of admissable solutions by displacement and constraint, expressed in terms of Legendre polynomials. Transl. by A.R.H.

N84-25772# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.

COMPOSITE MATERIALS: THE USER AND THE PRODUCER [LES COMPOSITES: UTILISATEUR ET PRODUCTEUR]

R. Radondy and Tremillon (ELF Aquitaine, France) 23 Feb. 1984 34 p In FRENCH Presented at Salon Intern. des Tech. et Energies du Futur (SITEF) 83, Toulouse, 18 - 23 Oct. 1983

(SNIAS-832-111-108) Avail: NTIS HC A03/MF A01

International competition requires the aircraft manufacturer to be constantly on the look out for recent construction materials having the best performance, mass, and cost. Carbon-resin composites are a good comprise for aircraft structures. Currently introduced in moveable surface of civil aviation aircraft, the carbon-resin composite should eventually be adopted for large size primary structures. The process of fiber production is being mastered. To meet the expectations of the aeronautics industry, new generations of carbon fibers were developed (T.400, X.550, type 3, etc.). The intrinsic characteristics of these fibers are discussed as well as the comparative performance of layered structures prepared from T.300 and T.400. Composites used on the Caravel, the Concorde, the Airbus, the Mirage 2000, the Falcon 10, and the ATR 42 aircraft are discussed. Improvements required in properties and fabrication processes are identified.

Transl. by A.R.H.

N84-25773# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.

A NEW METHOD OF ANALYSIS OF COMPOSITE STRUCTURES

G. Duvaut (Paris Univ. 6) and M. Nuc 1983 14 p refs Presented at the AAAF 9th European Rotorcraft and Powered Lift Aircraft Forum, Stresa, Italy, 13-15 Sep. 1983

(SNIAS-832-210-105) Avail: NTIS HC A02/MF A01

Direct calculation of deformation of composite materials consisting of high tensile resin-impregnated fibers using the finite elements method raises major difficulties due mainly to the very high number of heterogeneities in the material. Computation methods are, therefore, based on investigation of equivalent homogeneous materials, i.e., the effective behavior moduli. The general method of homogenization is presented which leads to an homogenized equivalent macroscopic structure and to a localization precedure for computing the field of microscopic stresses and stress forces. The method is applied to two types of composite materials: material reinforced by periodically arranged, parallel fibers and material consisting of a very large number of parallel layers of homogeneous materials superposed periodically.

A.R.H.

N84-25774# Electrical Research Association, Leatherhead (England).

INVESTIGATION OF THE RF PROPERTIES OF CARBON FIBRE COMPOSITE MATERIALS Final Report

D. A. Bull, G. A. Jackson, A. McHale, and B. W. Smithers Jul. 1982 282 p

(AD-A140261; ERA-81-109; DRIC-BR-84464) Avail: NTIS HC A13/MF A01 CSCL 11/4

The resistivity of small CFC samples at frequencies up to 300 MHz was measured using Q-meter techniques. Values of 0.00003 to 0.00015 ohm-meter are typical at low frequencies and increase with increasing frequency indicating the presence of skin effect. Samples showed little change in their d.c. resistance as a result of prolonged exposure to various liquids although boiling in tap or sea water produced substantial increases in resistance. Screening effectiveness to magnetic fields in the range 0.15 - 30 MHz and electric fields in the range 30 - 1000 MHz was measured for panels of CFC incorporated as one face of a copper cubic enclosure and as one surface panel of a Wessex helicopter tail cone. Screening effectiveness of a cylinder completely fabricated from CFC was also measured. Results indicate that the screening effectiveness of a CFC or part CFC fuselage, particularly in the hf band, will be critically dependent on the electrical continuity of bonds and joints and may be significantly less than for present day metal airframes. At vhf and uhf the screening effectiveness of part CFC and present day metal airframes are similar. The performances of vhf and uhf aerials when mounted on CFC or metal ground planes were similar and essentially within manufacturers' specifications. GRA

N84-25775# Virginia Polytechnic Inst. and State Univ., Blacksburg. College of Engineering.

THERMO-MECHANICAL AND THERMAL BEHAVIOR OF HIGH-TEMPERATURE STRUCTURAL MATERIALS Interim Report, 1 Jan. - 31 Dec. 1983

D. P. H. Hasselman, L. D. Bentsen, J. J. Brennan, H. Hencke, and T. D. Nguyen 31 Dec. 1983 225 p

(Contract N00014-78-C-0431)

(AD-A140520) Avail: NTIS HC A10/MF A01 CSCL 11/4

Technical ceramics represent a class of materials eminently suited for many critical engineering applications. Unfortunately, because of their brittleness and unfavorable combination of pertinent material properties, technical ceramics generally are highly susceptible to catastrophic failure in non-uniform thermal environments, which give rise to thermal stresses of high magnitude. The objective of the present program is to improve the qualitative and quantitative understanding of the nature of thermal stress failure of brittle structural materials, including the experimental as well as theoretical variables. In order to achieve this objective, the participating investigators and scope of the program are organized such that full advantage is taken of the combined inputs from a number of engineering disciplines. In a similar spirit, a number of studies were conducted in cooperation with investigators at other institutions. The effort of this program consists of four main themes, including: experimental thermal shock testing with

supporting analyses, measurement of thermophysical properties relevant to thermal stress failure, the analysis of mechanisms of thermal stress failure and the dissemination of information on thermal stresses in the form of review articles, conferences, etc. GRA

N84-26434 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Aircraft Div.
EXPERIMENTAL INVESTIGATION OF DELAMINATIONS IN CARBON FIBER COMPOSITE
W. Geier, J. Vilsmeier, and D. Weisgerber *In its* Tech. and Sci. Publ. 1983 1983 p 37-59 Presented at 56th AGARD SMP Panel Meeting/Specialists' Meeting on Characterization, Anal., and Significance of Defects in Composite Mater., London, 10-15 Apr. 1983 (For primary document see N84-26430 16-81)
(MBB-FE-214/S/Pub/107) Avail: Issuing Activity

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-25776*# Young (Edmond) and Associates, Mickleton, N.J.
OPPORTUNITIES FOR THE CHEMICAL INDUSTRY IN SPACE, PART 1 Final Report
Feb. 1984 101 p
(Contract NASw-3826)
(NASA-CR-173594; NAS 1.26:173594) Avail: NTIS HC A06/MF A01 CSCL 07D

The chemical/petrochemical industry devotes a large percentage of its gross income to research and development, with much of its R and D of a long-term nature. As the chemical industry is examined as a candidate for space investigations, it is readily apparent that research and development in the space environment may lead to attractive commercial opportunities. The advantages of low gravity manufacturing, with a particular emphasis on chemical catalysts, are presented herein specifically for the chemical industry. Research from the Skylab program and Apollo Soyuz test project is reviewed, including acoustic levitation, crystal growth, and container less melts. Space processing of composite materials, alloys, and coatings is also discussed. R.S.F.

N84-25777# Royal Aircraft Establishment, Farnborough (England).
STRUCTURE FORMATION IN AN ELECTRIC FIELD AND THE COMPOSITION OF ELECTRORHEOLOGICAL SUSPENSIONS
A. D. Matsepuro Jul. 1983 23 p refs Transl. into ENGLISH from Issled. i Pril. (Minsk), 1981 p 27-51
(AD-B081902; RAE-Lib-Trans-2110; BR91288) Avail: NTIS HC A02/MF A01

Various models which were proposed to explain the ER-effect was reviewed. Winslow's concept of structural transformation was further developed. Experimental evidence to show that the electrical polarization of the activator absorbed onto the dispersed phase is fundamental to the ER-effect is cited. The properties required of the continuous and dispersed phases, and suitable activating agents and surfactants are discussed. E.A.K.

N84-25778*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DETERMINATION OF THE SUCCINONITRILE-BENZENE AND SUCCINONITRILE-CYCLOHEXANOL PHASE DIAGRAMS BY THERMAL AND UV SPECTROSCOPIC ANALYSIS
William Kaukler (Universities Space Research Association), Donald O. Frazier, and Barbara Facemire Apr. 1984 19 p
(NASA-TM-82581; NAS 1.15:82581) Avail: NTIS HC A02/MF A01 CSCL 07D

Equilibrium temperature-composition diagrams were determined for the two organic systems, succinonitrile-benzene and succinonitrile-cyclohexanol. Measurements were made using the common thermal analysis methods and UV spectrophotometry. Succinonitrile-benzene monotectic was chosen for its low affinity for water and because UV analysis would be simplified. Succinonitrile-cyclohexanol was chosen because both components are transparent models for metallic solidification, as opposed to the other known succinonitrile-based monotectics. Author

N84-25779*# Ohio State Univ., Columbus. Dept. of Physics.
ANALYSIS OF CARBON DIOXIDE BANDS NEAR 2.2 MICROMETERS
M. S. Abubaker and J. H. Shaw Jul. 1984 26 p refs Submitted for publication
(Grant NsG-7479; OSURF Proj. 711626)
(NASA-CR-173605; NAS 1.26:173605) Avail: NTIS HC A03/MF A01 CSCL 07D

Carbon dioxide is one of the more important atmospheric infrared-absorbing gases due to its relatively high, and increasing, concentration. The spectral parameters of its bands are required for understanding radiative heat transfer in the atmosphere. The line intensities, positions, line half-widths, rotational constants, and band centers of three overlapping bands of CO2 near 2.2 microns are presented. Non-linear least squares (NLLS) regression procedures were employed to determine these parameters. R.S.F.

N84-25780# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
THE DETECTION OF ORGANIC CONTAMINATION OF SURFACES BY INFRARED SPECTROSCOPY
Oct. 1982 25 p refs
(ESA-PSS-01-705-Issue-1; ISSN-0379-4059) Avail: NTIS HC A02/MF A01

The test procedures for the detection of organic contamination of surfaces by direct and indirect means with the aid of infrared spectroscopy are discussed. The direct method consists of placing infrared-transparent discs inside a vacuum chamber or clean room, etc. Contamination of the discs is then analysed by means of an IR spectrophotometer. In an indirect method, the contaminants on the surface to be tested are collected by means of washing or wiping. The resultant contaminated liquid/tissue is then processed and finally a disc containing the contaminants is analysed with the aid of a spectrophotometer. R.J.F.

N84-25781# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
UNSTEADY COMBUSTION OF COMPOSITE FUEL DROPLETS Ph.D. Thesis - Ecole Centrale des Arts et Manufactures de Chatenay Malabry
Francis Dupoirieux 1983 82 p refs In FRENCH; ENGLISH summary Report will also be announced as ESA-TT-868
(ONERA-NT-1983-3; ISSN-0078-3781; ESA-TT-868) Avail: NTIS HC A05/MF A01

The theory of fuel droplet combustion is helpful in understanding what goes on in the combustion chambers of diesel, rocket and other types of IC engines. A droplet combustion was constructed, based on the following assumptions: the droplet contains two distinct miscible fuels. The unsteady terms are included. The physical properties (thermal conductivity, mass diffusion coefficients) depend on gas phase composition and temperature. The effects of pressure variation are taken into account, with the pressure being either given or computed. On the other hand, since the combustion is assumed to be spherically symmetrical about the center, of the droplet, the convection due to a gas phase velocity far from the droplet cannot be taken into account. Author

N84-25782# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
POSSIBILITIES OF INFRARED SPECTROSCOPY WITH TUNABLE SEMICONDUCTRO LASERS Ph.D. Thesis - Paris-Sud Univ.
Phillipe Prastault 1983 147 p refs In FRENCH; ENGLISH summary Report will also be announced as ESA-TT-869

(ONERA-NT-1983-4; ISSN-0078-3781; ESA-TT-869) Avail: NTIS HC A07/MF A07

The uses of semiconductor lasers that are tunable in the infrared wavelengths are discussed. A test setup was constructed to characterize the spectral and spatial properties of the laser emission from different diodes and then two applications were developed: (1) high resolution spectra were measured for gases as CH4, NO and NO2. The spectral interpretation by the L.S.M. shows that detailed examples the great advantage this technique holds in molecular spectroscopy, (2) Detection of gas components. The semiconductor laser was found to be a tool that is adaptable to difficult environments and capable of producing valuable information on how the reactions in combustive phenomena work. In particular, the temperature and concentration are measured simultaneously in a well stirred reactor, from an absorption line plot. The data on this come from a CO line. Author

N84-25783# Technische Univ., Berlin (West Germany). Inst. fuer Chemieingenieurtechnik CIT 3.

DESULFURIZATION OF HOT REDUCING GAS BY MEANS OF METAL OXIDES IN A FIXED BED REACTOR Final Report, Mar. 1983

Michael Kluge and Gerd Proy Bonn Bundeministerium fuer Forschung und Technologie Mar. 1984 181 p refs In GERMAN; ENGLISH summary Sponsored by Bundeministerium fuer Forschung und Technologie

(BMFT-FB-T-84-015; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 34,50

The calculation of thermodynamic equilibrium for reducing gases in the temperature range of 950 to 1550 K shows that sulfur exists only as hydrogen sulfide and carbon sulfide. Theoretical investigations of the reactions of these sulfur compounds with metallic oxides leads to the result that reducing gases with a water content of 5% can be cleaned to sulfur contents less than 50 ppm. Zinc oxide and manganese oxide can be used till about 1050 K, calcium oxides till about 1120 K and barium oxide in the entire temperature range. Experiments were carried out in the fixed bed reactor with barium, zinc and calcium oxide as well as dolomite with particle sizes of 0.8 to 8 mm within the temperature range of 960 to 1300 K. Total sulfur concentrations between 10 and 35 ppm in the gas could be achieved. A mathematical model was developed with which the velocity of sulfur acceptance can be calculated by desulfurization with lime stone at 1150 K. The calculation of a reactor scale-up is therefore possible for certain cases. Theoretical investigations of the regeneration of calcium sulfide with steam-oxygen-and oxygen-nitrogen mixtures show that the sulfur concentration in the waste gas increases with the oxygen content of the regenerating gas. In the practice however a large quantity of calcium sulfate is formed so that a successfull regeneration cannot be carried out. B.W.

N84-25784# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Bereich Neue Technologien.

HIGH TEMPERATURE ELECTROLYSIS OF WATER VAPOR: HOT ELLY, PHASE 2A Final Report, Apr. 1983

Wolfgang Doenitz, Erich Erdle, Hajo Hermeking, Alfred Koch, Wulf Kock, Reinhard Roettenbacher, Wolfgang Schaefer, Reinhold Schamm, and Rainer Schmidberger Bonn Bundeministerium fuer Forschung und Technologie Feb. 1984 252 p refs Sponsored by Bundeministerium fuer Forschung und Technologie

(BMFT-FB-T-84-032; ISSN-0340-7608) Avail: NTIS HC A12/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 42

The systematic continuation of the basic developments for the high temperature electrolysis of water vapor with respect to a technical realization of the process are described. The optimization of the electrolyte geometry and of the materials for the interconnection of cells as well as the manufacture and tests of electrolysis tubes consisting of serial connected cells were the central tasks. For single cells as well as for serial connected cells stable operation over a period of 1000 h were demonstrated. Characteristic data for an electrolysis tube at 1000 C and an average cell voltage of 1.33 V were a current density of 0.37 A/sq cm and a H2O conversion of 85%. For the integration of a large number of electrolysis tubes into so called modules, which represent the smallest units of future electrolysis plants, a constructional concept was developed and successfully tested with respect to all its essential elements. Author

N84-25785# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

SURFACE CHEMISTRY OF NiO (100) M.S. Thesis

R. P. Furstenau 1984 141 p

(AD-A140233; AFIT/CI/NR-84-2T) Avail: NTIS HC A07/MF A01 CSCL 07/4

The hydrogen reduction process of NiO (100) was studied in detail using Auger Electron Spectroscopy (AES), X-ray Photoelectron Spectroscopy (XPS), and Low Energy Electron Diffraction (LEED). The data indicate that the reduction process is strongly temperature dependent. Although the surface lattice loses oxygen in the reduction process, the basic structure of the lattice remains the same. A model is proposed which describes the stoichiometric and reduced NiO (100) surface layers which gives good correlation with the observed data. In addition, the adsorption properties of ethylene on stoichiometric and reduced NiO (100) were also studied. The data indicate that although the surface of the reduced sample is mostly nickel, it does not adopt the adsorption properties of pure nickel metal. A model is also proposed which describes how the reduced NiO (100) surface accommodates the adsorption of ethylene molecules. GRA

N84-25786# Army Missile Command, Redstone Arsenal, Ala. Research Directorate.

LASER-INDUCED DECOMPOSITION OF SOME ALLYL HALIDES

J. K. McDonald and J. A. Merritt 23 Nov. 1983 30 p

(AD-A140426; AD-E950517; DRSMI/RR-84-2-TR) Avail: NTIS HC A03/MF A01 CSCL 07/2

CO2 laser-induced decomposition of several allyl halides has been performed, and where possible, results were compared to pyrolysis studies. Allyl chloride was found to follow a very complex reaction mechanism. The decomposition was observed to have a larger radical chain mechanism than reported for pyrolysis. Allyl bromide was observed to follow a reaction mechanism similar to pyrolysis, while allyl fluoride was found to follow mainly a unimolecular mechanism. Kinetic studies of allyl bromide and chloride were also performed. The bromide and chloride were determined to follow a first and three-halves overall reaction order, respectively. Most of the products observed from laser-induced decomposition are also formed in pyrolysis; however, differences in concentrations were also observed. Formations of polymeric deposits were found to be small. Benzene was one of the main products in all of the allyl halide decompositions. Chlorobenzene and toluene were produced from the laser-induced decomposition of 2,3-dichloropropene and 2-methyl-3-chloropropene, respectively. GRA

N84-25787# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

FLAMMABILITY TESTING FOR THE SCREENING OF SPACE MATERIALS

Oct. 1982 42 p

(ESA-PSS-01-721-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The test-process selection criteria for the flammability testing of materials proposed for use in manned and unmanned European Space Agency spacecraft and associated equipment are defined. The applicable test methods are included. R.J.F.

N84-25788# Battelle Columbus Labs., Ohio.

LITERATURE REVIEW ON OCCURENCE AND METHODOLOGY FOR DETERMINATION OF NICKEL, CHROMIUM, MANGANESE AND ARSENIC SPECIES IN AIR Final Report

R. M. Riggin, E. J. Mazey, and W. M. Henry Mar. 1984 56 p refs

(Contract EPA-68-02-3745)

(PB84-172105; EPA-600/4-84-026) Avail: NTIS

HC A04/MF A01 CSCL 07D

A critical literature review of the state of the art for speciation of arsenic, chromium, manganese, and nickel in atmospheric samples is performed. Techniques for distinguishing the compound forms and valence states of these metals are critically assessed. Advantages and limitations of the various speciation approaches are addressed. Three basic types of speciation procedures are identified: (1) direct analysis of particulate matter, (2) speciation of inorganic compounds after dissolution, and (3) sequential or selective extraction. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-25789 Ohio State Univ., Columbus.
HYDROGEN ATTACK MECHANISMS IN A 2-1/4 Cr1 Mo WELDED STEEL Ph.D. Thesis
Hugo Lopez 1983 136 p
Avail: Univ. Microfilms Order No. DA8403545

In this work by means of a highly sensitive dilatometer the HA kinetics of a 2-1/4 Cr-1 Mo steel plate and its weld metal were studied in the temperature and pressure regimes of 500-580 C and 2000-3000 PSI, respectively. The kinetic data generated from these experiments were explained using a model for bubble growth controlled by grain boundary self diffusion and the kinetic expressions corresponding to the BM and WM were used to construct Nelson diagrams. Moreover, a thorough microstructural analysis was carried out by employing scanning and transmission electron microscopy. The microstructural evaluation consisted of qualitative and quantitative determination of methane bubbles from electropolished specimens and two stage replicas. Finally based on microstructural observations the role of initial microporosity in the as received material on the subsequent development of methane bubbles and the effect of HA exposure times on further nucleation was investigated. Dissert. Abstr.

N84-25790# Oak Ridge National Lab., Tenn. Mathematics and Statistics Research.
MODELING BINARY ALLOY SOLIDIFICATION PROCESSES
V. Alexiades, D. G. Wilson, and A. D. Solomon Aug. 1983 34 p refs
(Contract W-7405-eng-26)
(ORNL/CSD-117) Avail: NTIS HC A03/MF A01

A macroscopic mathematical model is constructed describing the evolution of the phases of a binary alloy or mixture undergoing solidification under the action of simultaneous conduction of heat and diffusion of solute. The formulation is global, in the form of a pair of conservation laws valid over the whole region occupied by the alloy in a weak (distributional) sense. Thus it is especially convenient for numerical solution since it does not require tracking of the interface, which, in fact, may develop into a mushy zone. Author

N84-25791*# Arizona State Univ., Tempe.
INFLUENCE OF SOFT INCLUSIONS ON THE STRENGTH OF WROUGHT MATERIALS
Devdas Mizar Pai and M. C. Shaw 15 Jun. 1984 22 p refs
(Grant NAG1-339)
(NASA-CR-173610; NAS 1.26:173610) Avail: NTIS HC A02/MF A01 CSCL 11F

The three dimensional soft particles (such as sulfides, silicates and voids) present in most materials are modelled by circular voids in sheet metal. Relationships are sought between the shape and orientation of a hole after rolling and testing in tension. Then, the effect of hole shape and size on mechanical properties is considered experimentally. The presence of voids has a negligible influence on the ultimate tensile stress of ductile materials based on the unperforated area because plastic flow neutralizes the stress intensification present in the elastic region. However, the shape and orientation of the defects are found to play an important role relative to strain at fracture. In certain engineering applications the strain at fracture is more important than the stress at fracture and in this sense the presence of voids are considered to influence the strength of a ductile material. Author

N84-25792*# Arizona State Univ., Tempe.
TENSILE FRACTURE OF DUCTILE MATERIALS M.S. Thesis
Devdas Mizar Pai May 1984 69 p refs
(Grant NAG1-339)
(NASA-CR-173607; NAS 1.26:173607) Avail: NTIS HC A04/MF A01 CSCL 11F

For brittle materials, circular voids play an important role relative to fracture, intensifing both tensile and compressive stresses. A maximum intensified tensile stress failure criterion applies quite well to brittle materials. An attempt was made to explore the possibility of extending the approach to the tensile fracture of ductile materials. The three dimensional voids that exist in reality are modelled by circular holes in sheet metal. Mathematical relationships are sought between the shape and size of the hole, after the material is plastically deformed, and the amount of deformation induced. Then, the effect of hole shape, size and orientation on the mechanical properties is considered experimentally. The presence of the voids does not affect the ultimate tensile strength of the ductile materials because plastic flow wipes out the stress intensification caused by them. However, the shape and orientation of the defect is found to play an important role in affecting the strain at fracture. Author

N84-25793*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CREEP-RUPTURE BEHAVIOR OF CANDIDATE STIRLING ENGINE ALLOYS AFTER LONG-TERM AGING AT 760 DEG C IN LOW-PRESSURE HYDROGEN Final Report
Robert H. Titran May 1984 45 p refs
(Contract DE-AI01-77CS-51040)
(NASA-TM-83676; DOE/NASA/51040-55; E-2124; NAS 1.15:83676) Avail: NTIS HC A03/MF A01 CSCL 11F

Nine candidate Stirling automotive engine alloys were aged at 760 C for 3500 hr in low pressure hydrogen or argon to determine the resulting effects on mechanical behavior. Candidate heater head tube alloys were CG-27, W545, 12RN72, INCONEL-718, and HS-188 while candidate cast cylinder-regenerator housing alloys were SA-F11, CRM-6D, XF-818, and HS-31. Aging per se is detrimental to the creep rupture and tensile strengths of the iron base alloys. The presence of hydrogen does not significantly contribute to strength degradation. Based percent highway driving cycle; CG-27 has adequate 3500 hr - 870 C creep rupture strength and SA-FII, CRM-6D, and XF-818 have adequate 3500 hr - 775 C creep rupture strength. Author

N84-25794*# Marko Materials, Inc., North Billerica, Mass.
ADVANCED POWDER METALLURGY ALUMINUM ALLOYS VIA RAPID SOLIDIFICATION TECHNOLOGY Final Report
Ranjan Ray May 1984 47 p refs
(Contract NAS1-17578)
(NASA-CR-172343; NAS 1.26:172343) Avail: NTIS HC A03/MF A01 CSCL 11F

Aluminum alloys containing 10 to 11.5 wt. pct. of iron and 1.5 to 3 wt. pct. of chromium using the technique of rapid solidification powder metallurgy were studied. Alloys were prepared as thin ribbons (.002 inch thick) rapidly solidified at uniform rate of 10(6) C/second by the melt spinning process. The melt spun ribbons were pulverized into powders (-60 to 400 mesh) by a rotating hammer mill. The powders were consolidated by hot extrusion at a high reduction ratio of 50:1. The powder extrusion temperature was varied to determine the range of desirable processing conditions necessary to yield useful properties. Powders and consolidated alloys were characterized by SEM and optical metallography. The consolidated alloys were evaluated for (1) thermal stability, (2) tensile properties in the range, room temperature to 450 F, and (3) notch toughness in the range, room temperature to 450 F. Author

N84-25795# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Werstoff-Forschung

METALLURGY: DEVELOPMENT OF MATERIAL RECOVERY [METALLURGIE: WERKSTOFFENTWICKLUNG RUECKGEWINNUNG]

Wolfgang Bunk, ed., Manfred Boehmer, ed., Manfred Geyer, ed., Joel Hansen, ed., Herrmann Kissler, ed., and Carmen Renn, ed. 1 Jul. 1983 480 p refs In GERMAN Sponsored by Bundesministerium fuer Forschung und Technologie

Avail: NTIS HC A21/MF A01

The development of conveyor thrust point were examined. The following issues are emphasized: metallurgical processing techniques; materials development; powder metallurgy; fibrous materials; materials and component development ceramics; gas turbine materials; high temperature materials; materials recovery; and tribology. To increase the affectiveness of the techniques the fiber solid solution materials; refractory materials, materials for gas turbines, ceramics and bribologie are outlined. Transl. by E.A.K.

N84-25796# Centro Informazioni Studi Esperienze, Milan (Italy). Servizio Documentazione.

ON-LINE MONITORING OF THE TRUE CORROSION RATE IN POWER PLANTS

E. Diacci, R. Rizzi, and C. Ronchetti 1983 18 p refs Presented at ICOSM '83 Intern. Conf. on On-Line Surveillance and Monitoring, London, 31 Aug. - 2 Sep. 1983 Sponsored by Ente Nazionale per l'Energia Electricca and European Nuclear Energy Agency (CISE-2156) Avail: NTIS HC A02/MF A01

Systems capable of supplying corrosion rates use different methodologies and consist of a probe inserted in the plant and of an instrument for the conversion of the probe signals into corrosion rate. Current systems exploit the polarization resistance of a given electrode of the electric resistance of a wire that becomes thinner and thinner. In the latter case, the measurement gives the value of the metal loss between two successive measurements from with the average corrosion rate can be calculated. The polarization resistance is, instead, an electrochemical parameter obtained from the polarization of a metal electrode in the vicinity of the corrosion potential. The performance of such systems that make use of electrochemical methodologies for corrosion rate measurements is described for various applications including steam condensers and high purity water in high temperature and pressure conditions. A.R.H.

N84-25797# Societe Nationale Industrielle Aerospatiale, Suresnes (France). Lab. Central.

CRACKING THRESHOLD ON STEEL USED IN AERONAUTICAL CONSTRUCTION: INFLUENCE OF THE ENVIRONMENT [SEUIL DE FISSURATION SUR DES ACIERS UTILISES EN CONSTRUCTION AERONAUTIQUE INFLUENCE DU MILIEU AMBIANT]

D. Aliaga and G. Pons 17 Jun. 1983 22 p refs In FRENCH Presented at SFM Journees de Printemps sur la Fatigue Corrosion, 18 May 1983

(SNIAS-832-551-101; C.45.505) Avail: NTIS HC A02/MF A01

Fracture thresholds were determined for 16 NDC 13 and 30 NCD 16 steels in ambient air and in a corrosive milieu for ratios (R) of 0.1 and 0.5. The corrosive milieu for the 30 NDC 16 steel was an A3 solution. Polluted oil was used for the 16 NDC 13 steel. Experimental results show that the influence ratio for ambient air is weak for the 16 NDC 13 and more pronounced for 30 MDC 16 steel. The corrosive milieu exerts no deleterious action on the cracking threshold. On the contrary, for ambient air at R = 0.1, the threshold for 30 NDC 16 is twice as superior as that of 16 NDC 13, while the difference is very attenuated at R= 0.5. Examination of the ruptured surfaces shows good correlation between fractographic observations and experimental results. Values of elevated thresholds are explained by the presence of oxide deposits associated with roughness, by a important proportion of intergranular ruptures, and by the action of closure mechanisms. Transl. by A.R.H.

N84-25798# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

THE BLACK-ANODIZING OF ALUMINUM WITH INORGANIC DYES

Oct. 1982 31 p

(ESA-PSS-01-703-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

This specification defines the processes for black anodizing aluminum with cobalt sulphide and nickel sulphide inorganic dyes. The processes are suitable for use on ESA spacecraft and associated equipment where surfaces require high solar absorptance, high emittance, high optical blackness or a combination of these properties. Author

N84-25799# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

MATERIAL SELECTION FOR CONTROLLING STRESS-CORROSION CRACKING

May 1981 94 p refs

(ESA-PSS-01-736-Issue-1; ISSN-0379-4059) Avail: NTIS HC A05/MF A01

Criteria are given for use in selecting materials for spacecraft and associated equipment and facilities so that failure resulting from stress corrosion can be prevented. Three categories of materials are listed: metal alloys with, (1) high, (2) moderate and (3) low resistance to stress-corrosion cracking. Materials of both American and European origin are included. Author

N84-25800# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

DETERMINATION OF THE SUSCEPTIBILITY OF METALS TO STRESS CORROSION CRACKING

Sep. 1981 37 p

(ESA-PSS-01-737-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

Specifications are given for constant load stress corrosion testing of metal specimens taken from welded or unwelded material. Intended primarily for testing aluminum alloys, the tests are carried out under alternate immersion conditions in 3.5% sodium chloride over a 30-day exposure period. Specimen detail, test apparatus, acceptance criteria, and quality assurance are covered. A.R.H.

N84-25801# European Space Agency, Paris (France).

EVOLUTION OF THE PHONON SPECTRUM AND THE DENSITY OF STATES AT THE FERMI LEVEL NEAR THE MARTENSITIC TRANSFORMATION IN NiAl, Ti(NiCo), CuZnAl AND InTl ALLOYS

Daniel Abbe Jan. 1984 149 p refs Transl. into ENGLISH of "Evolution du spectre de phonoms et de la densite d'etats au niveau de Fermi a l'approche de la transformation martensitique dans les alliages NiAl, Ti(NiCo), CuZnAl et InTl" rept. ONERA-NT-1981-9 ONERA, Paris, 1981

(ESA-TT-767; ONERA-NT-1981-9) Avail: NTIS HC A07/MF A01

Martensitic transformation has been examined in regard to the particular mechanical properties of steels. This type of transformation, which was extended to iron-, copper-, and titanium-based alloys, has been the subject of renewed interest because of the remarkable memory or pseudo-elastic effects. The evolution of the photon spectrum and the density of states at the Fermi level as the martensitic transformation at zero degrees Kelvin is approached, and were investigated for several families of metallic alloys. The alloys examined were NiAl, Ti(NiCo), CuZnAl, and InTl. Measurements of specific heat at low and moderate temperatures coupled with measurements of magnetic susceptibility and neutron scattering suggest unstable modes and modifications of the alloy atomic structure, and give information on the electron-photon coupling. Models of lattice dynamics and structural phase changes are also discussed. R.S.F.

N84-25802# Metallgesellschaft, A.G., Frankfurt am Main (West Germany). Metall-Lab.

UTILIZATION OF ZIRCONIUM WASTES IN Al-SPECIAL ALLOYS Final Report, Dec. 1981

Hans-Peter Sattler Bonn Bundeministerium fuer Forschung und Technologie Jan. 1984 147 p refs In GERMAN; ENGLISH summary Sponsored by Bundeministerium fuer Forschung und Technologie
(BMFT-FB-T-84-020; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 31

A cheap and practicable process was developd by which Zr may be recovered from hitherto useless and environment-polluting waste pickle liquors, dust and cuttings, and in which the treated pickle liquor may be reused after appropriate replenishment. The recycled Zr in the form of Zr-fluoride salts lends itself extremely well to alloying Al. Positive factors are not only the far cheaper alloying raw materials in comparison with metallic zirconium, but also energy saving arising from short melting periods at temperatures just above liquidus. Drawbacks with regard to quality have not been observed as against the conventional technique; on the contrary, the properties of salt-treated Al alloys ae very likely to reveal some improvements. Author

N84-25803# Thyssen Stahl A.G., Duisburg (West Germany). Forschung Warmgewalzte Produckte Anwendungstechnik.
INVESTIGATIONS MADE TO IMPROVE THE COLD-CRACKING AND THE FRACTURE BEHAVIOR OF WELDED JOINTS IN HIGH-STRENGTH STRUCTURAL STEELS Final Report, Sep. 1982
Helmut Hoehne Bonn Bundeministerium fuer Forschung und Technologie Feb. 1984 159 p refs In GERMAN; ENGLISH summary Sponsored by Bundeministerium fuer Forschung und Technologie
(BMFT-FB-T-84-034; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32,50

For ten high strength structural steels with their yield strength ranging from 355 to 885 N sq mm, cold cracking studies were performed on real welds in comparison to laboratory tests. Numerous parameter studies concerning the accuracy and the modes of testing were conducted and the effects exerted by welding and materials parameters were investigated. Laboratory tests, suitable for classifying the cold cracking behavior, tend to produce too high or too low minimum working temperatures. At present, it is impossible to predict satisfactorily the cold cracking behavior through chemical analyses using the usual carbon equivalents. The toughness and the fracture tests were performed with a three step heat input in the as welded condition and subsequent to stress relief annealing. This resulted in valuable information on the targeted selection of a steel most suitable for the respective design and economically optimum for further processing. Author

N84-25804# Max-Planck-Institut fuer Eisenforschung, Duesseldorf (West Germany).
RANDOM FATIGUE OF STEELS: SEQUENCE EFFECTS DURING THE CRACK INITIATION PHASE Final Report, Dec. 1982
Peter Neumann, Horst Vehoff, and Hans-Heinrich Heitmann Bonn Bundesministerium fuer Forschung und Technologie Mar. 1984 146 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-040; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 30,50

Deformation properties and the damage processes of StE 47, StE 70 and 38NiCrMoV73 steels were investigated under service loads. It was found, that the elastic-plastic stress-strain behavior can be described with a simple Masing-model. The shapes of the hysteresis loops are identical to the doubled cyclic stress-strain curves, determined by incremental-step tests. After a short fatigue period (10% N) small semi-circular cracks were initiated at near surface inclusions. Therefore the number of cycles to failure is dominated by the crack growth behavior of micro-cracks. The crack growth rate cannot be described in terms of the linear-elastic fracture mechanics. However, there is a good correlation to an extension of the J-integral concept to cyclic loading (Z-integral). An improvement of the common service life predictions was obtained. From the crack growth law based on the Z-integral, a damage parameter was derived, which is given in terms of the stress amplitude and plastic strain amplitude. The accuracy of life calculations based on this parameter is better than 30% for all investigated loadings. A.R.H.

N84-25805# Rasselstein Aktiengesellschaft, Neuwied (West Germany).
DETINNING OF TIN PLATE SCRAP Final Report, Jan. 1983
Rolf Becker and Heinz Kammereck Bonn Bundesministerium fuer Forschung und Technologie Mar. 1984 26 p In GERMAN; ENGLISH summary Sponsored by Bundesminirterium fuer Forschung und Technologie
(BMFT-FB-T-84-045; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5,50

A method is described for preparing and detinning tinplate scrap in an alkaline bath at an electrolyte temperature of 90 C. Tin particles can also be removed from unlacquered tinplate scrap at short processing times. As compared to the margin amount obtained per ton in the sale of tinplate scrap, the detinning line will make a profit at a throughput of about 8.000 t/year. The annual capacity of the line is 10.000 t. A.R.H.

N84-25806# California Inst. of Tech., Pasadena.
WORKSHOP ON DYNAMIC FRACTURE HELD AT PASADENA, CALIFORNIA ON 17-18 FEBRUARY 1983 Final Report, 1 Dec. 1982 - 30 Nov. 1983
W. G. Knauss, K. Ravi-Chandar, and A. J. Rosakis Oct. 1983 241 p
(Contract DAAG29-83-M-0101)
(AD-A140194; ARO-19961.1-EG-CF) Avail: NTIS HC A11/MF A01 CSCL 11/6

This workshop was proposed to provide a forum for the discussion of problems to be overcome and research to be undertaken in the future in the area of dynamic fracture. Fundamental aspects of the problems were to dominate over the applied or engineering design facets. Practical problems were to be related to the mechanisms of explosives and impact damage. For individual titles, see N84-25807 through N84-25821.

N84-25807# Fraunhofer Inst. fuer Werkstoffmechanik, Freiburg (West Germany).
ON SOME CURRENT PROBLEMS IN EXPERIMENTAL FRACTURE DYNAMICS c39
J. F. Kalthoff *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 11-35 (For primary document see N84-25806 16-26)
(AD-P003102) Avail: NTIS HC A11/MF A01 CSCL 11/6

The term fracture dynamics includes both crack tip motion effects and dynamic loading of cracks. Based on the research work at the Fraunhofer-Institut fur Werkstoffmechanik (IWM) several topics are discussed regarding the subjects crack propagation, arrest of fact running cracks, time dependent loading in general, and loading of cracks by sharp stress pulses of short duration. Following the guidelines of the workshop, previous results are briefly summarized to state the current situation, but special consideration is given to still open questions and problems not yet resolved. Most experimental data reported in this paper have been generated by means of the shadow optical method of caustics. The caustics technique is an optical tool for measuring stress intensifications. The method has been applied very successfully in the field of fracture mechanics for determining stress intensity factors. Crack tip caustics are of a simple form and can easily be evaluated. The technique, therefore, is very well suited for investigating complex fracture problems, as for example in fracture dynamics. GRA

N84-25808# Brown Univ., Providence, R. I. Div. of Engineering.
A PLATE IMPACT EXPERIMENT FOR STUDYING CRACK INITIATION AT LOADING RATES K(I) APPROXIMATELY 10(8) MPa m/s
R. J. Clifton and G. Ravichandran *In* Calif. Inst. Technol. Workshop

on Dyn. Oct. 1983 p 36-46 (For primary document see N84-25806 16-26)
(Contract DAAG29-81-K-0121)
(AD-P003103) Avail: NTIS HC A11/MF A01 CSCL 11/6

A symmetric plate impact technique is being developed for establishing the critical conditions for dynamic fracture initiation at extremely high loading rates. The specimen consists of a circular disc with a mid-plane, prefatigued, edge crack that has propagated halfway across the diameter. A compressive pulse propagates through the specimen, reflects from the rear surface, and subjects the crack plane to a step tensile pulse. The motion of the rear surface of the specimen is monitored with a laser interferometer system in order to determine the loading time required for crack extension to begin. Using this time in the elastodynamics solution of the stress wave diffraction problem, one can obtain the critical value of the stress intensity factor for dynamic fracture initiation. Preliminary experiments are being conducted on SAE 4340 VAR steel. GRA

N84-25809# California Univ., Livermore. Lawrence Livermore Lab.
APPLYING MOLECULAR DYNAMICS TO FRACTURE
W. G. Hoover *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 47-56 (For primary document see N84-25806 16-26)
(AD-P003104) Avail: NTIS HC A11/MF A01 CSCL 11/6

The stress and strain fields of continuum fracture mechanics include unrealistic divergences at crack tips. These divergences can be avoided by using a detailed atomistic description. Such a description automatically characterizes the crack-propagation process. With current computing capabilities there is no difficulty in treating three-dimensional crystal lattices with complicated interparticle forces. In real metals the presence of lattice defects, including the crack tip itself, and the dependence of the forces on these defects preclude quantitative agreement with experiment, so that the computer simulations can be expected to provide understanding of experimental trends rather than replication of experimental results. The experiments described by using shadow patterns to measure the strength of strain fields near moving crack tips, contained interesting time dependent fluctuations. We have made an attempt to understand the structure of the rapidly moving cracks and to simulate the shadow patterns numerically. The particle trajectories are generated using molecular dynamics, and then shadow patterns are developed and compared with experimental results. This work will be described at length in a forthcoming thesis. Here we only outline the methods used, results obtained, and the problems remaining. GRA

N84-25810# SRI International Corp., Menlo Park, Calif.
SHORT PULSE FRACTURE MECHANICS
D. A. Shockey, J. F. Kalthoff, H. Homma, and D. C. Erlich *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 57-71 (For primary document see N84-25806 16-26)
(AD-P003105) Avail: NTIS HC A11/MF A01 CSCL 11/6

A research effort was begun eight years ago at SRI International to analyze the response of a crack struck by a short-lived tensile pulse and to modify static fracture mechanics concepts to allow predictions of dynamic crack instability. The results of this work, which have been presented in a series of papers over the past six years, comprise a unified extension of classical fracture mechanics and are summarized here. We first review considerations of the stress intensity history experienced by a dynamically loaded crack tip and deduce the instability criterion. Then we describe the experiments that were performed to test the minimum time criterion, present the results, and compare them with predictions of the criterion. The agreement between predictions and experimental results suggests that certain key aspects of crack instability under short pulse loads are understood and that this understanding can be applied to solve dynamic fracture problems. The current research effort is aimed at developing equipment and procedures for valid dynamic fracture testing, measuring for selected materials, and establishing minimum times for crack instability. GRA

N84-25811# Maryland Univ., College Park. Dept. of Mechanical Engineering.
DYNAMIC CRACK GROWTH IN POLYMERS c27
W. L. Fourney, R. Chona, and R. J. Sanford *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 75-99 (For primary document see N84-25806 16-26)
(AD-P003106) Avail: NTIS HC A11/MF A01 CSCL 11/9

Over the past several years, considerable effort has been directed towards developing two-dimensional, finite-element computer codes to predict crack propagation behavior in large structures. One of the input parameters to these computer codes is the relationship between the crack extension force (or the stress intensity factor) and the velocity of crack propagation in the material. Experimental investigations of the dynamic behavior of crack propagation and arrest in several different polymers, epoxies, and structural steels have been conducted. This paper summarizes briefly the highlights of the work performed at the University of Maryland over the period 1972 to 1982 using dynamic photoelasticity, high speed multi-flash photography, and finite element modeling to study crack propagation. GRA

N84-25812# California Inst. of Tech., Pasadena.
DYNAMIC CRACK GROWTH CRITERIA IN STRUCTURAL METALS
A. J. Rosakis, J. Duffy, and L. B. Freund *In its* Workshop on Dyn. Oct. 1983 p 100-119 (For primary document see N84-25806 16-26)
(AD-P003107) Avail: NTIS HC A11/MF A01 CSCL 11/6

Analytical difficulties associated with the dynamic crack propagation problem have limited the available dynamic solutions to idealized situations. The major limitations introduced by these analytical solutions make both numerical methods and direct experimental observations necessary for the complete understanding of the dynamic fracture process. A principal purpose of experimental studies is to observe directly the instantaneous stress intensity factor as a function of crack speed, and to determine whether or not the observed variation constitutes a material characteristic. The present paper provides a description of dynamic crack propagation experiments on double cantilever beam specimens of a high strength steel. Measurements of the crack tip deformation field and of crack speed during propagation have been made using the optical method of caustics in reflection. A principal advantage of a measurement made directly at the crack tip is that the interpretation of data does not rely on a complete transient stress analysis of the entire specimen. Author (GRA)

N84-25813# California Inst. of Tech., Pasadena.
PROCESSES CONTROLLING THE DYNAMIC FRACTURE OF BRITTLE SOLIDS c39
K. Ravi-Chandar and W. G. Knauss *In its* Workshop on Dyn. Oct. 1983 p 119-129 (For primary document see N84-25806 16-26)
(AD-P003108) Avail: NTIS HC A11/MF A01 CSCL 20/11

A brief summary of some experimental results on dynamic fracture of brittle solids is presented. A complete presentation of the various aspects of dynamic fracture is discussed. The experimental configuration used in these experiments simulate pressurized semi-infinite cracks in an unbounded medium (for the duration of the experiment: 150 microsec). The pressure loading on the crack faces is achieved by an electromagnetic loading device. The principle of the method is as follows: A cooper strip is doubled up and inserted into a slit machined into a large plate. A high current on the order of several thousand amperes is passed through the copper strip. The current in one leg of the strip interacts with the magnetic field generated by the other leg, and the result is a pressure force on the faces of the machined slit. The current is derived from a capacitor-inductor circuit and the time dependence of the current pulse and hence that of the pressure resembles a trapezoidal history with a 25 microsec rise time and 160 microsec total duration. This device is capable of delivering crack face pressures of up to approximately 60 MPa. GRA

N84-25814# Brown Univ., Providence, R. I. Div. of Engineering.
SOME THEORETICAL RESULTS ON THE DEPENDENCE OF DYNAMIC STRESS INTENSITY FACTOR ON CRACK TIP SPEED
L. B. Freund *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 129-136 (For primary document see N84-25806 16-26)
(AD-P003109) Avail: NTIS HC A11/MF A01 CSCL 11/6

Two specific topics are discussed under this common heading. The first is concerned with elastic-plastic crack growth and, in particular, with developing theoretical models to explain the dependence of dynamic fracture toughness on crack tip speed observed for 4340 steel and other high strength, low ductility materials which fail in a locally ductile manner. The second topic is concerned with limitations on the use of crack tip singular fields to describe actual stresses in elastic brittle materials during dynamic fracture. The problem discussed is the steady-state growth of a crack in the antiplane shear mode under small scale yielding conditions. Inertial resistance of the material is taken into account explicitly but, for steady state growth, the deformation is time independent as viewed by an observer fixed at the moving crack tip. Results are considered for two material models, elastic-ideally plastic and elastic-viscoplastic. GRA

N84-25815# Lund Inst. of Tech. (Sweden). Div. of Solid Mechanics.
ON CRACK PATHS
K. B. Broberg *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 140-155 (For primary document see N84-25806 16-26)
(AD-P003110) Avail: NTIS HC A11/MF A01 CSCL 11/6

In general the direction of crack propagation depends upon the propagation velocity, the ambient stress state (including its time variation), and the processes in the process region. In several cases the propagation velocity plays an insignificant role. These cases include certain fractures of thin plates at which the crack direction is outlined as a band of necking already before start of unstable crack growth. They also include certain fractures at plane strain, when the crack directions is obvious but still of minor interest. These cases include stability questions of the type: 'Is the straight path stable or not?' Then the answer 'yes' or 'no' is of primary interest, not the precise path at deviation from the straight line, which, moreover, generally depends upon the initial disturbance. In such cases a static analysis ought to be sufficiently informative. Even though branching in rare cases might appear at slow crack growth it is generally closely connected with rapid crack propagation. Thus the dynamic character of the phenomenon must be taken under consideration. Author (GRA)

N84-25816# Georgia Inst. of Tech., Atlanta. Center for the Advancement of Computational Mechanics.
PATH-INDEPENDENT INTEGRALS IN DYNAMIC FRACTURE MECHANICS
S. N. Atluri and T. Nishioka *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 156-168 (For primary document see N84-25806 16-26)
(AD-P003111) Avail: NTIS HC A11/MF A01 CSCL 11/6

We first consider linear elastodynamic crack propagation under mixed mode non-steady conditions with an arbitrary velocity. Now we consider the problem of analyzing crack-propagation in an arbitrary body, the shape of which and the loading on which, we suppose, preclude any possibility of an analytical solution. Suppose that we have to use a numerical solution. Such a numerical solution may be based on a propagating singular-element within which the asymptotic mixed made solution is embedded; and hence the K-factors can be evaluated directly, as demonstrated by the authors. GRA

N84-25817# Washington Univ., Seattle. Dept. of Mechanical Engineering.
CRACK BRANCHING, CRACK ARREST AND RAPID TEARING **c27**
A. S. Kobayashi *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 169-177 (For primary document see N84-25806 16-26)
(AD-P003112) Avail: NTIS HC A11/MF A01 CSCL 11/9

For the past several years, the author and his colleagues have been involved in various aspects of dynamic fracture research where dynamic photoelasticity was used to quantify the dynamic fracture parameters associated with a running crack in photoelastic polymers. The experimental data were also used to verify a dynamic finite element code executed in its generation and propagation modes. Experimentally measured crack velocity was then used to drive the verified finite element code in its generation mode to extract dynamic fracture parameters, which could not be measured directly, in metals and ceramics. In the following, some recent results obtained in three research projects on dynamic fracture using the above mentioned techniques are summarized. These results involve dynamic and static crack branching in Homalite-100 plates and metal pipes, dynamic crack arrest in structural ceramics and rapid tearing of thin polycarbonate sheets. Author (GRA)

N84-25818# Hibbitt, Karlsson and Sorensen, Providence, R.I.
DYNAMIC KINKING AND BIFURCATION OF CRACKS IN PLANE STRAIN **c39**
P. Burgers *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 178-186 (For primary document see N84-25806 16-26)
(AD-P003113) Avail: NTIS HC A11/MF A01 CSCL 11/2

The bifurcation event in dynamic crack propagation is an extremely complicated process. Typically, experiments show that the process is inherently three-dimensional in that the crack front is not straight. Also there is no single instant of bifurcation but in the process zone multiple bifurcation attempts are made by the propagating crack. Only a few of these attempts are successful on a macroscopic scale. For these successful bifurcation attempts, usually there is not a sharp point at which the crack kinks, but a short distance over which the crack direction changes rapidly. It is only recently that experimental results have been obtained for which the experiments are sufficiently simple that there is any hope of modelling them analytically. The detailed three dimensional situation existing at bifurcation is far too complex to be treated at present. It is true, however, that providing the microscopic details are not considered, the approximation to planar deformation is not unreasonable. GRA

N84-25819# Texas A&M Univ., College Station.
DYNAMIC, STEADY-STATE CRACK PROPAGATION IN LINEAR ISOTROPIC VISCOELASTIC MATERIAL
J. R. Walton *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 197-204 (For primary document see N84-25806 16-26)
(AD-P003114) Avail: NTIS HC A11/MF A01 CSCL 11/6

This paper is a summary of results of some recent analytical studies of dynamic, steady-state crack propagation in linear viscoelastic material. Closed form solutions are presented for the problems of a semi-infinite, anti-plane shear crack propagating with constant speed in an infinite general linear viscoelastic body and in a layer of finite thickness. For both boundary value problems, and for a general class of shear modulus, the solutions obtained exhibit a universal structure that depends in a simple way upon the time dependent shear modulus and crack speed. The forms for the solutions are convenient for the extraction of qualitative and quantitative information about the dependence of the stress field in the body upon the loading, the crack speed and the shear modulus. Author (GRA)

N84-25820# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
VISCOELASTIC EFFECT ON DYNAMIC CRACK PROPAGATION IN HOMALITE 100
K. S. Kim, K. L. Dickerson, and W. G. Knauss *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 205-225 (For primary document see N84-25806 16-26)
(AD-P003115) Avail: NTIS HC A11/MF A01 CSCL 11/6

The optical method of caustics is used to determine the stress intensity factor for a running crack in a viscoelastic material. A formulation of the quasi-static deformation of materials with rheologically simple shadow-optic creep functions is derived for the caustics, solved numerically and applied to the fracture testing

of Homalite-100 at various temperatures (40 deg C - 100 deg C). Theoretical and experimental caustics show good agreement in shape even for moderately high crack speeds (150 - 300 m/sec). Results also show that the relation between the stress intensity factor and the crack speed for Homalite 100 is highly sensitive to temperature variations. Author (GRA)

N84-25821# Battelle Columbus Labs., Ohio.
SOME THOUGHTS ON THE SUBJECT OF DYNAMIC ELASTIC-PLASTIC ANALYSES OF RAPID CRACK PROPAGATION AND CRACK ARREST
M. F. Kanninen *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 226-233 (For primary document see N84-25806 16-26)
(AD-P003116) Avail: NTIS HC A11/MF A01 CSCL 11/6

Despite the fact that the basic assumption of linear elastic fracture mechanics - contained-yielding - is violated for a crack that grows, most attempts to characterize rapid crack propagation and arrest are nevertheless rooted in LEFM. Together with the growing necessity to analyze crack arrest under conditions where large scale plasticity is expected, this fact is prompting researchers to develop dynamic elastic-plastic analyses. Starting from LEFM-based analysis procedures that form the current state-of-the-art, this paper attempts to provide some perspective for this evolutionary trend in dynamic fracture mechanics. Emphasized are some of the potential dilemmas that face the researchers pursuing this subject. Author (GRA)

N84-25822# Polytechnic Inst. of New York, Brooklyn.
DEFORMATION OF BIMETALLIC BICRYSTALS OF ALPHA-Ti/BETA-Ti-13Mn
C. S. Lee and H. Margolin Nov. 1983 17 p
(Contract N00014-80-C-0742)
(AD-A140263) Avail: NTIS HC A02/MF A01 CSCL 20/2

Alpha-beta interfaces play an important role in the mechanical properties of alpha/beta alloys. These interfaces are the sites of hydrogen segregation and hydride precipitation. In addition there have been a number of investigations which have reported the presence of what has been designated interface phase, and the role of the interface phase on transmitting deformation across the interface has been considered in two separate investigations. Numerous observations have been made that voids formed at alpha/beta interfaces. Fatigue cracks have been observed to form and propagate along alpha/beta interfaces. Catastrophic fracture has also been found to occur at these interfaces. All of these observations attest to the importance of alpha/beta interfaces in controlling properties of alpha/beta Ti alloys. Although plastic deformation studies of single crystal alpha-Ti have been carried out and single crystal studies of beta-Ti have been made, no studies, up to this investigation, have been carried out on alpha/beta bimetallic bicrystals. GRA

N84-25823# Rensselaer Observatory, Troy, N. Y.
REDUCED GRAIN BOUNDARY MOBILITY AND THE SINTERING OF MOLYBDENUM Final Report, 1 Sep. 1981 - 29 Feb. 1984
R. M. German Apr. 1984 12 p
(Contract DAAG29-81-K-0152)
(AD-A140265; ARO-18238.6-MS) Avail: NTIS HC A02/MF A01 CSCL 11/6

The sintering of a refractory metal like molybdenum requires a high temperature which can cause rapid grain growth, pore isolation and poor sintered properties. An analysis has been performed of the sintering behavior to isolate specific actions which will aid sintering and retard grain growth. This analysis has led to a Mo-Ni-SiO2 composition which experimentally exhibits high sinterability and a fine grain size. Other experiments and analysis have been performed to better define activated sintering and to help develop a better theory. Author (GRA)

N84-25824# Dayton Univ., Ohio.
FATIGUE CRACK GROWTH RATE DATA FOR ALUMINUM ALLOY 6061-t651 PLATE Interim Technical Report, Mar. - Aug. 1983
J. J. Ruschau Wright-Patterson AFB, Ohio AFWAL Feb. 1984 26 p
(Contract F33615-82-C-5039; AF Proj. 2421)
(AD-A140325; UDR-TR-83-120; AFWAL-TR-84-4018) Avail: NTIS HC A03/MF A01 CSCL 11/6

Constant amplitude fatigue crack growth rate data were obtained for aluminum alloy 6061-T651 plate. Such data were obtained at two stress ratios, R=0.1 and 0.5, at room temperature and 300 deg F. Both the T-L and L-T orientations of a single 1/2-inch (13mm) thick plate were examined. Final crack growth rate data are presented in both graphical and tabular formats, using the analyses and presentation schemes developed by the University of Dayton Research Institute for the Revised Damage Tolerant Design Handbook. Author (GRA)

N84-25825# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
SILICON CARBIDE FIBER/MULLITE COMPOSITES FROM RAPIDLY SOLIDIFIED ALUMINOSILICATE POWDER Final Technical Report, 21 Jun. - 21 Dec. 1983
R. E. Tressler and G. L. Messing 1 Apr. 1984 20 p
(Contract DAAG29-83-K-0105)
(AD-A140529; ARO-20955.1-MS) Avail: NTIS HC A02/MF A01 CSCL 11/6

It has been demonstrated that mullite matrix ceramics can be formed by crystallizing an amorphous aluminosilicate powder in the presence of a transient liquid (B2O3) by hot pressing at 1050 deg C. A fiber-reinforced composite was fabricated by laying continuous SiC fibers between tape cast layers of the mullite composition and hot pressing at 1050 deg C and 21 MPa for 1/2 hr. The mechanical strength and toughness of samples tested perpendicular to the fiber direction were 110 MPa and 1.44 MPa.m, respectively. As these results were obtained with a porous, large grain size microstructure, that is not optimized, it is suggested that significant enhancement can be obtained through improvements in microstructure uniformity density, fiber distribution and by full crystallization of the mullite matrix. Thus, although a feasible method for fabricating SiC fiber reinforced mullite matrix ceramics has been demonstrated, realization of their full potential requires further study. GRA

N84-25614# Royal Aircraft Establishment, Farnborough (England). Materials and Structures Dept.
CORROSION CONTROL REQUIREMENTS FOR UK MILITARY AIRCRAFT
V. C. R. McLoughlin *In* AGARD Workshop on Requirements for Aircraft Corrosion Control Mar. 1984 5 p (For primary document see N84-25613 16-01)
Avail: NTIS HC A05/MF A01

N84-26433 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Zentrallab.
CHARACTERIZATION OF ALUMINUM OXIDE LAYERS
H. E. Franz *In its* Tech. and Sci. Publ. 1983 1983 p 29-45 refs In GERMAN; ENGLISH summary Original language document announced as N84-16330 (For primary document see N84-26430 16-81)
(MBB-BB-549-83-O) Avail: Issuing Activity

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-25826 Washington Univ., Seattle.
A DYNAMIC FRACTURE ASSESSMENT OF IMPACT DAMAGE IN STRUCTURAL CERAMICS Ph.D. Thesis
Been-Ming Benjamin Liaw 1983 160 p
Avail: Univ. Microfilms Order No. DA8404924

Dynamic fracture characterizations of glass and RBSN at room temperature and under static loading are dealt with. In contrast, dynamic fracture results of RBSN at room temperature and under

impact loading showed that the initial period of acceleration was negligible and the crack did not decelerate when the dynamic stress intensity factor was considerably less than the static fracture toughness. Static analysis can be used to predict the room temperature, dynamic fracture response of RBSN because of its low crack velocity with respect to the longitudinal wave speed. A mechanistically consistent damage model, which is based on elastic failure at tensile and shear overloads, is used to construct a phenomenological, finite element model of impact damage of ceramics at room temperature. Dissert. Abstr.

N84-25827# Mound Lab., Miamisburg, Ohio.
INTERFACE FORMATION IN PHYSICALLY DEPOSITED FILMS
Gary V. Nessiage 8 Sep. 1983 12 p
(Contract DE-AC04-76DP-00053)
(MLM-3089) Avail: NTIS HC A02/MF A01

Short (10-15 min) physical vapor deposition cycles are employed in fabricating thin films of 3-4 micrometers. Interruption of a cycle is of concern, particularly for longer cycles, since loss of processing time becomes a major factor when rejecting all interrupted runs. Several substrate samples having aluminum deposits that had been interrupted during the deposition cycle were prepared to evaluate the formation of interfaces between the layers. In the case where the deposition was interrupted but the thermal and vacuum conditions were maintained, the presence of a layer or interface was not detected by Auger Electron Spectrometry (AES), Scanning Electron Microscopy (SEM) and optical microscopy analytical techniques. Author

N84-25828# Materials Research Labs., Melbourne (Australia). Organic Chemistry Div.
INTERACTIONS BETWEEN F-111 FUSELAGE FUEL TANK SEALANTS. PART 1: CHARACTERISATION OF POLYESTER SEALANTS AND THEIR HYDROLYTIC DEGRADATION PRODUCTS
P. J. Hanhela and D. B. Paul Dec. 1983 24 p refs
(MRL-R-657-Pt-1; AR-003-298-Pt-1) Avail: NTIS HC A02/MF A01

Interactions between polysulfides and the hydrolysis products of polyester sealants EC 5106 and EC 5146 within integral fuselage fuel tanks of F-111 aircraft lead to fuel leaks. To assist in determining the mechanisms involved in this process a study of the physical changes which occur during contact of typical polysulfides with actual and model polyester products is to be undertaken. Prior to this investigation a detailed analysis of the polyester sealants was necessary to assist selection of model degradation products. Exhaustive degradation of the polyester resins using the transesterification reagent of lithium methoxide in methanol provided suitable samples for analysis by gc/ms and other spectroscopic techniques. Major components were shown to be sebacic acid and neopentyl glycol. The most significant difference between the two polyester prepolymers was in the larger proportion of trihydric alcohol in EC 5146 which would result in a greater degree of crosslinking of this sealant compared with EC 5106. B.W.

N84-25829*# National Aeronautics and Space Administration, Washington, D. C.
FABRICATION OF HIGHLY DENSE SIN4 CERAMICS WITHOUT ADDITIVES BY HIGH PRESSURE SINTERING
Kazumasa Takatori, Mashiko Shimade, and Mitue Koizumi Apr. 1984 8 p refs Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77425; NAS 1.15:77425) Avail: NTIS HC A02/MF A01 CSCL 11B

Silicon nitride (Si3N4) is one of candidate materials for the engineering ceramics which is used at high temperatures. The mechanical strengths of hot pressed or sintered Si2N4 ceramics containing some amount of additives, however, are deteriorated at elevated temperatures. To improve the high temperature strength of Si3N4 ceramics, an attempt to consolidate Si3N4 without additives was made by high pressure sintering technique. Scanning electron micrographs of fracture surfaces of the sintered bodies showed the bodies had finely grained and fully self-bonded sintered bodies were 310N sq m at room temperature and 174N/sq m at 1200 C. Author

N84-25830*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEPOSITION STRESS EFFECTS ON THERMAL BARRIER COATING BURNER RIG LIFE
James W. Watson (Northwestern Univ.) and Stanley R. Levine 1984 15 p refs Presented at the 11th Intern. Conf. on Met. Coatings, San Diego, Calif., 9-13 Apr. 1984; sponsored by the American Vacuum Society
(NASA-TM-83670; E-2113; NAS 1.15:83670) Avail: NTIS HC A02/MF A01 CSCL 21B

A study of the effect of plasma spray processing parameters on the life of a two layer thermal barrier coating was conducted. The ceramic layer was plasma sprayed at plasma arc currents of 900 and 600 amps onto uncooled tubes, cooled tubes, and solid bars of Waspalloy in a lathe with 1 or 8 passes of the plasma gun. These processing changes affected the residual stress state of the coating. When the specimens were tested in a Mach 0.3 cyclic burner rig at 1130 deg C, a wide range of coating lives resulted. Processing factors which reduced the residual stress state in the coating, such as reduced plasma temperature and increased heat dissipation, significantly increased coating life. Author

N84-25831*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF SUBSTRATE CHEMICAL PRETREATMENT ON THE TRIBOLOGICAL PROPERTIES OF GRAPHITE FILMS
Robert L. Fusaro 1984 21 p refs Presented at the 3rd Intern. Conf. on Solid Lubrication, Denver, 5-9 Aug. 1984; sponsored by the American Society of Lubrication Engineers
(NASA-TM-83574; E-1956; NAS 1.15:83574) Avail: NTIS HC A02/MF A01 CSCL 11G

Rubbed films of natural flake Madagascar graphite were applied to ASTM A-355(D) steel with chemical surface pretreatments of zinc phosphate, gas nitride, salt nitride, sulfo-nitride, and with mechanical pretreatment (sandblasting). SAE 1045 steel pins were slid against these films using a pin-on-disk tribometer. The results indicate that two different lubricating mechanisms can occur. In the chemical surface pretreatment, the graphite can mix together to form a surface layer of the two constituents and this plasticity flowing layer provides the lubrication. The longest endurance lives and the lowest pin wear rates were obtained with this mechanism. In the other, surface topography appeared to control the mechanism. A rough surface was necessary to serve as a reservoir to supply the graphite to the flat metallic plateaus where it was sheared in very thin films between the plateaus and the sliding pin surface. For this mechanism, chemical pretreatment seemed to do little more than serve as a means for roughening the surface. Mean friction was not significantly influenced by chemical pretreatment, but surface roughness effects were observed. Author

N84-25832# National Aerospace Lab., Tokyo (Japan).
THREADWISE ANALYSIS OF WOVEN FABRIC COMPOSITES
Takashi Ishikawa and Tsu-Wei Chou Nov. 1983 18 p refs
(NAL-TR-792T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The upper and lower bounds of elastic stiffness and compliance constants of woven fabric composites are derived based upon a mosaic-like model as well as the assumptions of constant stress and constant strain. An approximate analysis taking into account fiber undulation and continuity also is conducted. The results indicate that fiber undulation leads to slight softening of the in-plane stiffness and does not affect the stretching bending coupling constants, as compared to the results of a mosaic model. A transverse shear deformation is adopted and modified to examine the one dimensional bending response of fabric composites. The results of a two dimensional finite element show good agreement with the predictions of the in-plane, coupling and bending constants based upon the fiber undulation, mosaic and transverse shear deformation theory, respectively. Convergence characteristics and

some effects of boundary conditions in finite element analysis are examined before comparison. The effect of fiber undulation shape on the in-plane compliance also is investigated. Author

N84-25833# Societe Nationale Industrielle Aerospatiale, Suresnes (France). Lab. Central.
INFLUENCE OF THE ENVIRONMENT ON THE APPLICATION AND DRYING QUALITY OF ORGANIC PAINTS [INFLUENCE DES CONDITIONS D'AMBIANCE LORS DE L'APPLICATION ET DU SECHAGE SUR LA QUALITE DES PEINTURES ORGANIQUES]
28 Nov. 1983 23 p In FRENCH Presented at SURFAIR 4 Journees d'Etudes Intern. des Traitements de Surface dans l'Ind. Aeron. et Spatiale, Cannes, France, Sep. 1982
(SNIAS-832-551-102; C.44.593) Avail: NTIS HC A02/MF A01

Problems that surface during the painting of aircraft are associated with the chemical nature of the paints used. Aircraft manufacturers are using type 2 polyurethanes with a hydrolyzed polymer and a polyisocyanate. A climate chamber in which the spraying and drying of paints can be accomplished under strictly controlled conditions is described. The conditions for the appearance of microblisters are listed and the probable cause is identified as carbon dioxide in the film. The benefits of airless and pneumatic spray guns are examined. Studies show that paint should dry at ambient temperatures without any special deposition. Time for the second coating should not be any longer than 6 to 8 hours for base paint and only 4 hours for the decorative trim.
Transl. by A.R.H.

N84-25834# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
THE APPLICATION OF THE BLACK ELECTRICALLY CONDUCTIVE COATING CHEMGLAZE H322
Feb. 1983 37 p
(ESA-PSS-01-734-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The process for the application of CHEMGLAZE H322 black electrically conductive coating is defined. It is utilized either with Primer Lesonal 01-66050, where necessary, or even without primer, and is suitable for use on ESA spacecraft and associated equipment. R.J.F.

N84-25835# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
THE APPLICATION OF THE BLACK ELECTRICALLY CONDUCTIVE COATING CHEMGLAZE L300
Dec. 1982 38 p
(ESA-PSS-01-735-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

A process is described for the application of CHEMGLAZE L300 black electrically conductive coating on Pyrolac P123 primer. This coating is suitable for use on ESA spacecraft and associated equipment. Author

N84-25836# Kloeckner-Humboldt-Deutz A.G., Oberursel (West Germany). Abteilung Hochdrucksintertechnik.
PRODUCTION OF CUBIC CRYSTALLINE BORON NITRIDE Final Report, Dec. 1982
Dieter Kreubig and Guenter Noll Bonn Bundeministerium fuer Forschung und Technologie Jan. 1984 47 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-025; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10

Cubic crystalline boron nitride (cBN) is used for cutting and grinding tools of high performance. Up to now there has been no cBN production by West European companies. An appropriate high pressure high temperature apparatus for the production of cBN from hexagonal boron nitride (hBN) was developed and built, and a synthesis process was devised and tested. Ng,Mg3N2, Li3N, Al and Si were investigated as initiators (catalysts) of the process. A first survey of the influence of the materials used and the synthesis parameters on the formation and growth of the cBN crystals was gained. Present work is concentrated on the production of cBN grains with properties as required by manufacturers of grinding and cutting tools. Author

N84-25837# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany). Advanced Technology Div.
DEVELOPMENT OF NEW ABSORBER COATINGS FOR HIGH TEMPERATURE APPLICATIONS Final Report, Sep. 1982
Edwin Erben Bonn Bundeministerium fuer Forschung und Technologie Feb. 1984 99 p refs In GERMAN; ENGLISH summary Sponsored by Bundeministerium fuer Forschung und Technologie
(BMFT-FB-T-84-033; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

Experimental studies about the development of new spectrally selective absorber systems for the temperature range 400 to 700 C were reported. Intensive works were carried by means the coating techniques chemical vapor deposition, electroplating and heterogeneous reactions between gas and solid using new coating materials. Three new absorber systems were developed. Author

N84-25838# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SYNTHESIS AND INVESTIGATION OF POLYIMIDOBENZIMIDAZOLES
N. P. Lyubchenko and B. A. Zhubanov 29 Mar. 1984 8 p Transl. into ENGLISH from Izv. Akad. Nauk Kazakhskoy SSR, Ser. Khim. (USSR), no. 4, Jul. - Aug. 1972 p 49-53
(AD-A140184; FTD-ID(RS)T-0372-84) Avail: NTIS HC A02/MF A01 CSCL 11/10

Among the polyheteroarylenes, the polybenzimidazoles represent a large group of polymers which posses increased thermal stability. The synthesis of polybenzimidazoles by the method of interphase polycondensation is described, along with the prepolymers utilized. The thermal stability of the synthesized polymers was determined by thermogravimetric analysis. All of the polybenzimidazoles were found to be stable in air up to 300 C. R.S.F.

N84-25839# Massachusetts Univ., Amherst. Dept. of Chemistry.
METAL-CHELATE POLYMERS: STRUCTURAL/PROPERTY RELATIONSHIPS AS A FUNCTION OF THE METAL ION Interim Technical Report
R. D. Archer, C. J. Hardiman, K. S. Kim, E. R. Grandbois, and M. Goldstein Mar. 1984 25 p
(Contract N00014-81-K-0611)
(AD-A140205; TR-5) Avail: NTIS HC A02/MF A01 CSCL 07/3

Polymers containing metal ions can exhibit properties quite different from the parent polymers from which they are derived. Metal ions added to preformed polymers can produce marked property changes, especially when the metal modifies the polymer backbone, as is the case in some of the polymeric hydrazones we have been investigating. When polymer syntheses are designed to place the metal ion directly in the backbone, even more pronounced differences are possible. Classically, planar arrays with conjugated ligands were used for thermal stability but they tend to produce intractability and yield only low molecular weight species. We are evaluating several methods which can minimize such intractability, including: oxe metal ions, such as uranyl (VI); bulky ligands, such as alkyl substituted ligands; and nonrigid eight-coordinate centers, such as tungsten(IV). Author (GRA)

N84-25840*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
CUMULATIVE CREEP DAMAGE FOR POLYCARBONATE AND POLYSULFONE
M. J. Zhang and H. F. Brinson May 1984 37 p
(Contract NCC2-71; Grant NAG1-227; Contract N00014-82-K-0185)
(NASA-CR-173433; NAS 1.26:173433; AD-A140227; VPI-E-84-12) Avail: NTIS HC A03/MF A01 CSCL 11/9

The literature for creep to failure cumulative damage laws are reviewed. Creep to failure tests performed on polycarbonate and polysulfone under single and two step loadings are discussed. A cumulative damage law or modified time fraction rule is developed using a power law for transient creep response as the starting point. Experimental results are approximated well by the new rule. Damage and failure mechanisms associated with the two materials are suggested. Author (GRA)

N84-25841# Texas Research Inst., Inc., Austin.
EFFECTS OF STRESS ON PERMEATION AND POLYURETHANE DEGRADATION Final Report
P. E. Cassidy 1 Mar. 1983 18 p
(Contract N00014-82-C-2208)
(AD-A140260) Avail: NTIS HC A02/MF A01 CSCL 11/9

Water permeation through elastomers and plastics has been studied for many years. The past ten years have witnessed increased interest in this phenomenon in regard to failure modes and expected lifetimes of sonar transducers. The basis of this concern lies in the fact that transducer design often calls for rubber to be the primary barrier to seawater penetrating into the electroacoustic spaces of the transducer. A seemingly very important consideration that has been overlooked up to now is the effect of stress on the permeability of the rubber barrier. Two types of stress are commonly present when rubber is used in transducers: a static stress due to the rubber being stretched; and a dynamic stress resulting from the rubber being subjected to acoustic vibration. If these factors affect water permeation, then the behavior and lifetime of the transducer will differ from that expected. GRA

N84-25842# System Planning Corp., Arlington, Va.
SYNTHESIS OF REFRACTORY COMPOUNDS WITH GASLESS COMBUSTION REACTIONS Final Task Statement Report, FY82 - FY83
W. L. Frankhouser, K. W. Brendley, M. C. Kieszek, and S. T. Sullivan Sep. 1983 172 p
(AD-A140296) Avail: NTIS HC A08/MF A01 CSCL 11/2

The Defense Advanced Research Projects Agency has sponsored a basic materials research and development program in advanced materials technology in which System Planning Corporation (SPC) has participated as a subcontractor to Lawrence Livermore National Laboratory. This document presents a final task report on gasless combustion synthesis technology. Combustion synthesis processes and theory are investigated. Soviet processing patents in four countries are described and assessed. SPC analytical combustion models are presented. Suggestions are made in regard to future synthesis experiments in the laboratory. Author (GRA)

N84-25843# Bristol Univ. (England).
APPLICATION OF OPTICAL METHODS, INCLUDING OPTICAL INTERFERENCE, TO MEASURE THE DIMENSIONAL STABILITY OF RESINS, RESIN BASED ADHESIVES AND RESIN BASED COMPOSITES Annual Progress Report
K. H. G. Ashbee and J. P. Sargent Dec. 1983 42 p
(Contract DAJA45-83-C-0030)
(AD-A140297; APR-1) Avail: NTIS HC A03/MF A01 CSCL 11/9

As a consequence of osmosis during water uptake in the case of polycarbonates and as a consequence of osmosis followed by freezing of the aqueous solutions associated with osmosis in polyesters and epoxies, hairline cracks have been observed. The cracks are filled with water solution, and the small mismatch in acoustic impedance between polymer and water makes them extremely difficult to detect with ultrasound. Although the cracks are as much as a millimeter in lateral dimensions, the small separation between fracture surfaces and hence the small size of the crack volume makes for difficult detection by radiographic techniques. Specialized optical techniques, including rectified optics transmission microscopy and interferometry, appear to be the most satisfactory methods for their observation. These techniques have been used in the present studies and have permitted estimates to be made of the stress intensity factors at which hairline cracking occurs in each of the three polymers. GRA

N84-25844# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
SYNTHESIS AND PROPERTIES OF PHENYLATED AROMATIC HETEROCYCLIC IMIDE AND THIAZOLE POLYMERS CONTAINING PENDANT DIPHENYLETHER AND DIPHENYLSULFIDE GROUPS Final Report, Jan. - Aug. 1982
B. A. Reinhardt and F. E. Arnold Oct. 1983 27 p
(AF Proj. 241-9)
(AD-A140341; AFWAL-TR-83-4052) Avail: NTIS HC A03/MF A01 CSCL 07/3

High molecular weight aromatic heterocyclic polyphenylenes have been prepared through Diels-Alder reactions of biscyclopentadienones and heterocyclic diacetylenes. The imide and thiazole polymers with pendant phenyl groups in conjunction with either diphenylether or diphenylsulfide groups exhibit unusual solubility in aromatic hydrocarbon solvents. Introduction of the diphenylether or diphenylsulfide pendants were made via the biscyclopentadienodes. The thermal, thermal oxidative, and thermal mechanical properties of these new polymers were investigated. Author (GRA)

N84-25845# Rheology Research, Gaithersburg, Md.
DEVELOPMENT OF METHODS OF EVALUATION EXTENSIONAL PROPERTIES OF POLYMER SOLUTIONS FROM MEASUREMENTS OF SHEAR Technical Report, Apr. 1982 - Apr. 1983
E. A. Kearsley Aberdeen Proving Ground, Md. Army Chemical Systems Lab. Jun. 1983 32 p
(Contract DAAK11-82-M-0008)
(AD-A140451; ARCSL-CR-83076) Avail: NTIS HC A03/MF A01 CSCL 11/9

Although large extensional flow components occur in many important technological processes of liquids, there is no currently suitable device to measure the elongational properties of polymer solutions. To obtain such measurements the BKZ model of the mechanical behavior of polymer solutions was formulated to infer extensional properties from shear measurements. Both the technique and its limitations are discussed in this report. Stress relaxation measurements of five solutions were taken and show promise for the practicality of this procedure for inferring extensional fluid properties. Author (GRA)

N84-25846# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
THE OIL IMPREGNATION OF PHENOLIC-RESIN-BASED MATERIALS USED IN THE FABRICATION OF BALL-BEARING CAGES
Aug. 1983 21 p
(ESA-PSS-01-712-Issue-1; ISSN-0379-4059) Avail: NTIS HC A02/MF A01

The cleaning and oil-impregnation process for phenolic-resin-based materials reinforced with bleached cotton used in the fabrication of ball-bearing cages proposed for use in ESA Spacecraft and associated equipment is described. Material handling hazards and quality control are discussed. R.J.F.

N84-25847# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
MEASUREMENT OF THE PEEL AND PULL-OFF STRENGTH OF COATINGS AND FINISHES WITH PRESSURE-SENSITIVE TAPES
Oct. 1982 29 p
(ESA-PSS-01-713-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

Details of a test method in which pressure-sensitive tapes are used to assess the suitability of coatings, paints, films, etc. and other thin materials proposed for use on European Space Agency spacecraft and associated equipment are given. The test will determine the peel or pull-off strength of these materials and their ability to adhere to a substrate. R.J.F.

N84-25848# European Space Research and Technology Center, Noordwijk (Netherlands). Chemical Assurance Div.
THE APPLICATION OF THE BLACK PAINT CHEMGLAZE Z306
Dec. 1982 38 p
(ESA-PSS-01-725-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The process for producing a low outgassing matt black coating to spacecraft or associated equipment, by means of CHEMGLAZE Z306 black polyurethane paint on PYROLAC P123 three-part epoxy primer is discussed. Pretreatment, cleaning, masking, and the protection of surfaces are discussed. R.J.F.

N84-25849# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
THE CLEANING OF ECCOSORB AN FOAM
Oct. 1982 20 p
(ESA-PSS-01-727-Issue-1; ISSN-0379-4059) Avail: NTIS HC A02/MF A01

A process that reduces the high level of outgassing of ECCOSORB AN (microwave absorbant foam) in the as received condition to a level acceptable for general spacecraft applications is described. The treatment has no significant effect on other properties of this material. Author

N84-25850# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
THE APPLICATION OF THE THERMAL-CONTROL PAINT PYROLAC PSG 120FD
Oct. 1982 39 p
(ESA-PSS-01-733-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The process by which PYROLAC PSG120FD white, zinc-oxide-pigmented, silicone-based thermal-control coating (paint) on PYROLAC P128 primer is used to produce a low outgassing thermal coating on spacecraft items is discussed. Electrolytic gold surfaces require pretreatment with PYROLAC P123 primer before PYROLAC P128 primer can be applied. R.J.F.

N84-25851# National Bureau of Standards, Washington, D.C.
MECHANICAL BEHAVIOR OF ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE Annual Report, 1 Oct. - 20 Sep. 1983
J. M. Crissman Jan. 1984 44 p refs Sponsored in part by Food and Drug Administration
(PB84-175538; NBSIR-84-2808(FDA); AR-4) Avail: NTIS HC A03/MF A01 CSCL 11I

This report describes work done during FY 1983 under task 80-01, NBS-FDA/BMD (Bureau of Medical Devices) Interagency Agreement. The report covers the fourth year of a four year project concerned with the study of the morphology and mechanical properties of ultra high molecular weight polyethylene (UHMWPE). The work done during FY 1983 dealt principally with the following aspects of the mechanical behavior of UHMWPE: (1) the temperature dependence of the creep and recovery behavior of uniaxial extension and compression at small deformations; (2) longer term (> 1 day) creep and recovery behavior of uniaxial extension and compression at small deformations, (3) the effect of gamma irradiation on the creep and recovery behavior, and (4) the effect of gamma irradiation on the environmental stress-crack resistance of UHMWPE. Author (GRA)

N84-25852# Akron Univ., Ohio. Inst. of Polymer Science.
SCIENCE OF ADHESION
A. N. Gent and G. R. Hamed 1983 108 p refs
(PB84-176734; NSF/OIR-83009) Avail: NTIS HC A06/MF A01 CSCL 11A

Adhesion is defined and several mechanisms of adhesion, including mechanical interlocking, interdiffusion, adsorption and surface reaction, and electrostatic attraction, are discussed. Various types of surface treatments are described that alter the surface region in one or more of the following ways: (1) removal of a weak boundary layer; (2) change in surface topography; (3) change in chemical nature of the surface; and (4) modification in the physical structure of the surface. Interfacial chemical bonding is addressed and the fracture mechanics of simple joints is examined. The need for research in the following areas is emphasized: (1) studies of the mechanisms of bond degradation; (2) investigations of the strength of joints in which debonds of known size are present; and (3) studies to determine the mechanism by which surface treatments enhance the bondability of substances. GRA

N84-25811# Maryland Univ., College Park. Dept. of Mechanical Engineering.
DYNAMIC CRACK GROWTH IN POLYMERS
W. L. Fourney, R. Chona, and R. J. Sanford *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 75-99 (For primary document see N84-25806 16-26)
(AD-P003106) Avail: NTIS HC A11/MF A01 CSCL 11/9

N84-25817# Washington Univ., Seattle. Dept. of Mechanical Engineering.
CRACK BRANCHING, CRACK ARREST AND RAPID TEARING
A. S. Kobayashi *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 169-177 (For primary document see N84-25806 16-26)
(AD-P003112) Avail: NTIS HC A11/MF A01 CSCL 11/9

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-25853# Materials Research Labs., Melbourne (Australia). Physical Chemistry Div.
A THERMAL STABILITY TEST FOR PRIMARY EXPLOSIVE STAB SENSITIZERS: STUDY OF THE THERMAL AND HYDROLYTIC STABILITY OF 1-PICRYL-5-NITROTETRAZOLE
Paul P. Elischer and Robert J. Spear Feb. 1984 21 p refs
(MRL-R-918; AR-003-899) Avail: NTIS HC A02/MF A01

A screening test for determining thermal stability of primary explosives which are considered as replacements for tetrazene was developed. In this test, at 89 deg C, 2-picryl-5-nitrotetrazole (PNT) has a half life 4 to 5 times longer than tetrazene. Both materials have adequate hydrolytic stability and replacement of tetrazene by PNT in stab and percussion sensitive mixes should enhance shelf life. Thermal decomposition of tetrazene is approximately exponential while PNT exhibits autocatalysis. E.A.K.

N84-25854*# Simmonds Precision Products, Inc., Vergennes, Vermont. Instrument Systems Div.
STUDY OF EFFECTS OF FUEL PROPERTIES IN TURBINE-POWERED BUSINESS AIRCRAFT Final Report
F. D. Powell, R. J. Biegen, P. G. Weitz, Jr., and A. M. Duke Apr. 1984 89 p refs
(Contract NAS3-22827)
(NASA-CR-174627; E-2470; NAS 1.26:174627) Avail: NTIS HC A05/MF A01 CSCL 21D

Increased interest in research and technology concerning aviation turbine fuels and their properties was prompted by recent changes in the supply and demand situation of these fuels. The most obvious change is the rapid increase in fuel price. For commercial airplanes, fuel costs now approach 50 percent of the direct operating costs. In addition, there were occasional local supply disruptions and gradual shifts in delivered values of certain fuel properties. Dwindling petroleum reserves and the politically sensitive nature of the major world suppliers make the continuation of these trends likely. A summary of the principal findings, and conclusions are presented. Much of the material, especially the tables and graphs, is considered in greater detail later. The economic analysis and examination of operational considerations are described. Because some of the assumptions on which the economic analysis is founded are not easily verified, the sensitivity of the analysis to alternates for these assumptions is examined.

The data base on which the analyses are founded is defined in a set of appendices. Author

N84-25855# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
MULTIPATH PYROTECHNIC RELAY: CONCEPTION WITH NUMERICAL SIMULATIONS AND EXPERIMENTAL VALIDATION [RELAIS MULTIVOIE PYROTECHNIQUE: CONCEPTION PAR SIMULATIONS NUMERIQUES ET VALIDATION EXPERIMENTALE]
Souletis (Societe Nationale des Poudres et Explosifs, Vert-le-Petit, France), R. Thivet (Societe Nationale des Poudres et Explosifs, Vert-le-Petit, France), J. P. Durand, and A. Langellier 1984 21 p refs In FRENCH Presented at 12th Explosives and Pyrotech. Symp., San Diego, Calif., 13 - 15 Mar. 1984
(SNIAS-832-422-101) Avail: NTIS HC A02/MF A01

The design and use of pyrotechnic devices whose operation brings into play known and easily controllable physical phenomena allows reduction in the amount of work needed to qualify the devices. A relay with a small diameter cylindrical setup is considered and its operating mechanism is simulated in three dimensions numerically. The validy of the procedure is verified experimentally by visualization of the setup and a comparison of calculations with the experiment. Transl. by A.R.H.

N84-25856# Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France). Service Pyrotechnie.
EVALUATION OF MATERIAL OF THERMAL RESPONSE Final Report [EVALUATION DE MATERIAL DE RESPONSE THERMIQUE]
M. Arnoud Paris ESA 12 Oct. 1983 234 p In FRENCH
(Contract ESTEC-5297/82/NL-BI)
(DGT-23.190A; ESA-CR(P)-1859) Avail: NTIS HC A11/MF A01

Test material designed for measuring the thermal response of an igniter in a pyrotechnic initiator, was evaluated using standardly produced A.M.D.-B.A. type 1 TAP WH 40 and 1 TAP AW 40 initiators. An experimental study was also conducted to determine the thermal response of initiators of construction identical to that of the 1 TAP WH 40 but simplified so as to reveal possibilities for fault detection in such a manner that the influence of the 1 ampere 5 minute test on the thermal response and its consequences on the behavior of the igniter during firing could be measured. A.R.H.

N84-25857# Naval Weapons Support Center, Crane, Ind. Applied Sciences Dept.
VISIBLE PYROTECHNIC FLARE SPECTROSCOPY USING VIDICONS Final Report, 1 Oct. 1982 - 1 Jul. 1983
H. A. Webster, III 30 Aug. 1983 15 p Presented at the 1982 Ann. Fall Meeting of the Pyrotechnic and Explosive Appl. Section of the Am. Defense Preparedness Assoc., Orlando, Fla., 17-18 Nov. 1982
(F34-372)
(AD-A140283; NWSC/CR/RDTR-207) Avail: NTIS HC A02/MF A01 CSCL 19/1

The use of an optical multichannel analyzer (OMA) for obtaining the visible spectra of pyrotechnic flares is described. The configuration and design of the vidicon/spectrometer interface is presented. The visible spectrum of a standard Navy yellow flare, the Mk 118 Mod O Marine Smoke and Illumination Signal, obtained with the OMA is discussed. The advantages and disadvantages of the OMA system as a tool for flare spectroscopic measurements are discussed. Author (GRA)

N84-25858# Naval Weapons Support Center, Crane, Ind. Applied Sciences Dept.
VISIBLE SPECTRA OF STANDARD NAVY COLORED FLARES Final Report, 1 Oct. 1982 - 1 Aug. 1983
H. A. Webster, III 15 Aug. 1983 21 p
(F34-573)
(AD-A140342; NWSC/CR/RDTR-206) Avail: NTIS HC A02/MF A01 CSCL 19/1

The visible spectra, color data and output powers from standard Navy red, green and yellow signal flares are presented. The spectra were taken under essentially identical conditions on actual in-service Navy devices. The dominant emissions accounting for the output power in the flares are from the molecular bands of the alkaline earth oxides, hydroxides and chlorides in the red and green flares and from atomic sodium in the yellow flare. Author (GRA)

N84-25859# Virginia Polytechnic Inst. and State Univ., Blacksburg.
MICROBIOLOGICAL AND BIOCHEMICAL STUDIES TOWARDS OPTIMIZATION OF SUBSTRATE UTILIZATION BY METHANOGENIC BACTERIA Annual Report, Dec. 1982 - Dec. 1983
J. G. Ferry Dec. 1983 35 p refs
(PB84-179753; GRI-84/0011) Avail: NTIS HC A03/MF A01 CSCL 21D

The microbiology and biochemistry of acetate conversion to methane was studied. A new acetotrophic methane-producing organism (Metanosarcina acetivorans) was isolated and characterized which showed that it is uniquely suited for biochemical and genetic studies. This organism and other acetotrophic and methylotrophic methane-producers were genetically classified by DNA-DNA and DNA-RNA homologies. This cell material was used to study the biochemical pathway of acetate metabolism to methane. Properties of the carbon monoxide dehydrogenase and methylreductase components of this system were studied in detail. This organism also contained cofactor B and a new cofactor (FAF) recently discovered in H2-oxidizing methane-producers. The results suggest that these enzymes and cofactors may be involved in the pathway. GRA

N84-25860# Colorado School of Mines, Golden.
LIQUID-VAPOR AND SOLID-LIQUID-VAPOR PHASE EQUILIBRIA IN NATURAL GAS SYSTEMS Annual Report, 1 Jan. 1983 - 1 Jan. 1984
A. J. Kidnay and E. D. Sloan Jan. 1984 44 p
(PB84-179191; GRI-84/0043) Avail: NTIS HC A03/MF A01 CSCL 21D

Solid-liquid-vapor phase equilibria were measured for the binary systems carbon dioxide plus methane, carbon dioxide plus ethane, and carbon dioxide plus propane over the temperature region 204 to 216 K. Vapor-liquid phase equilibria were measured for carbon dioxide plus methane at 212 K, carbon dioxide plus ethane at 204, 209, and 212 K, and carbon dioxide plus propane at 216 K. GRA

N84-25861# National Bureau of Standards, Washington, D.C. National Measurement Lab.
ASSESSING THE CREDIBILITY OF THE CALORIFIC VALUE OF MUNICIPAL SOLID WASTE Interim Report, 1 Oct. 1980 - 30 Sep. 1983
K. L. Churney, E. S. Domalski, A. E. Ledford, J. C. Colbert, S. S. Bruce, T. J. Buckley, R. C. Paule, and M. L. Reilly Feb. 1984 51 p
(Contract DE-AI01-76PR-06010)
(PB84-175470; NBSIR-84-2825(DOE)) Avail: NTIS HC A04/MF A01 CSCL 21D

A study has been made at the National Bureau of Standards to establish the limits of reliability of the calorific value of municipal solid waste (MSW) by the bomb calorimetric procedure currently used in commercial test laboratories. This procedure involves using gram-size samples derived from MSW that has been processed down to a particle size of 2 mm or less. Critics of the procedure argue that gram-size samples are too small to be representative of such a heterogeneous material, and that processing MSW alters its composition. To test the bomb calorimetric procedure, a 2.5 kg capacity combustion flow calorimeter was designed and constructed for the determination of the enthalpies of combustion of kilogram-size samples of MSW in flowing oxygen near atmospheric pressure. Author (GRA)

N84-25862# Northwestern Univ., Evanston, Ill. Dept. of Chemistry.
STOICHIOMETRIC CO REDUCTION BY SUPPORTED METAL CARBONYLS Annual Report, Dec. 1982 - Jan. 1983

D. F. Shriver Jan. 1984 11 p
(PB84-175025; GRI-84/0029) Avail: NTIS HC A02/MF A01 CSCL 21D

The overall project objective is to study stoichiometric reactions on supported organometallic complexes with emphasis on the reduction of carbon monoxide. Previous work in their laboratory showed that the homogeneous proton induced reduction of CO to CH4 in metal carbonyls in neat super acid is greatly dependent on the metal cluster nuclearity. A study of the effect of metal nuclearity on the heterogeneous reduction of CO should provide insight on the physical requirements for CO reduction. Ways to improve product selectivity in this complex reaction may also result. Author (GRA)

N84-26448 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
CHARACTERIZING SHAPED CHARGE BY STAND-OFF BEHAVIOR
Manfred Held *In its* Tech. and Sci. Publ. 1983 1983 p 299-309 refs Presented at 7th Intern. Symp. on Ballistics Proc., The Hague, 19-21 Apr. 1983 (For primary document see N84-26430 16-81)
(MBB-UA-693-83-O) Avail: Issuing Activity

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-25863 Technische Univ., Munich (West Germany). Inst. fuer Statistik und Unternehmensforschung.
ON A SERIES OF PROBLEMS WITH MACHINES: COSTS OF MODERNIZATION AND STORAGE IN CASE OF DEMAND [UEBER EIN EIN-MASCHINEN-REIHENFOLGEPROBLEM MIT UMRUEST - UND LAGERHALTUNGSKOSTEN BEI VORGESCHRIEBENEM BEDARF]
Ulrich Gschrei Jul. 1983 121 p refs In GERMAN
(TUM-M8312) Copyright. Avail: Issuing Activity

Production planning which is concerned with the determination of optimal operation projects of multiple materials on one or multiple machines is discussed. Lot sizes and production sequence are determined to keep expenses to a minimal. Random lot sizes are allowed. An optimal production order of a single article was investigated. This problem is considered to be a sequence problem. Transl. by E.A.K.

N84-25864# Cranfield Inst. of Tech., Bedfordshire (England).
EVOLUTION OF A HEAVE CONTROL SYSTEM FOR AN AMPHIBIOUS HOVERCRAFT
P. A. T. Christopher, K. F. Man, Y. N. Cheng, and E. W. Osbourn Jan. 1984 234 p refs
(CAR-8401; ISBN-0902937-97-9) Avail: NTIS HC A11/MF A01

A heave control system for amphibious hovercraft was designed and tested. The central element in the system being an axial flow, lift fan whose blade angles are continuously varied by means of feedback signals from a pressure transducer located in the front end of the hovercraft cushion and from an accelerometer measuring the heave acceleration are discussed. Results from experiments, conducted on the Cranfield Whirling-Arm facility, have shown that the system provides a rapid and effective means of controlling the heave acceleration, and, in addition, produces a valuable reduction in craft drag whilst traversing waves. An extensive parameter identification program, using a nonlinear optimization algorithm, was constructed and applied to the control subsystem, such that a full mathematical model of the controlled craft was obtained. This was then used to design an optimum control with particular reference to passenger ride comfort. Author

N84-25865# Societe Nationale Industrielle Aerospatiale, Paris (France). Direction Technique.
THE INDUSTRY'S MATERIALS: SNIAS AND GENERAL CONDITIONS OF ITS ENVIRONMENT [LES MATERIAUX DE L'INDUSTRIE: AEROSPATIALE ET LES CONDITIONS GENERALES DE LEURS ENVIRONMENTS]
20 Jun. 1983 11 p In FRENCH
(SNIAS-832-502-101) Avail: NTIS HC A02/MF A01

An overview of the physical characteristics, service life, and prevalent environmental conditions of aircraft and spacecraft construction materials is presented. Emphasis is placed on light weight, high strength metal alloys, and various fiber reinforced composite materials. The role these materials play in the construction of supersonic and subsonic transport aircraft, satellites, civil aircraft, helicopters, and missile engines is charted.
Transl. by M.A.C.

N84-25866# Societe Europeenne de Propulsion, Vernon (France). Dept. Espace.
INDUSTRIALIZATION OF EMITTERS MODULES, PART 2 Final Report
Bugeat, Macaigne, Talmont, and Valentian Paris ESA 7 Nov. 1983 135 p
(Contract ESTEC-5152/82/NL-PB)
(SEP-TS/SE/BT/10457/83-Pt-2; ESA-CR(P)-1861-Pt-2) Avail: NTIS HC A07/MF] A01

This report on the Field Emission Electric Propulsion (FEEP) development program deals with the large emitters clustering and endurance test which have been performed with these emitters modules. The main parts of this test program have been the following: test facility modifications, preliminary test with new 80 mm emitter and endurance test (more than 1000 hours). The test facility modifications have been performed to allow continuous firing mode with fully automatic data acquisition and control. The preliminary tests have allowed to check the validity of the selected solutions or to improve them. The endurance test performed on a cluster of two 80 mm emitters has demonstrated that after 1200 hours firing the emitting region presented no erosion trace.
Author

N84-25867# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
CONTAMINATION AND CLEANLINESS CONTROL
Aug. 1983 53 p
(ESA-PSS-01-201-Issue-1; ISSN-0379-4059) Avail: NTIS HC A04/MF A01

The criteria to be met by personnel, items and operations in clean rooms for spacecraft and associated equipment so that the strict levels of environmental cleanliness and contamination control required by the European Space Agency (ESA) can be achieved and maintained are defined. Possible spacecraft failures or malfunctions due to contamination are detailed and guidelines for the production of the cleanliness requirement specification and the cleanliness control plan are given. R.J.F.

N84-25868# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
PRESERVATION, STORAGE, HANDLING AND TRANSPORTATION OF ESA SPACECRAFT HARDWARE
Jun. 1983 26 p
(ESA-PSS-01-202-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The physical integrity of ESA spacecraft hardware is specified. The ensurances include the absence of corrosion and contamination, which is maintained throughout all storage, handling and transportation operations. E.A.K.

N84-25869# European Space Research and Technology Center, Noordwijk (Netherlands). Products Assurance Div.
ESA PREFERRED PARTS LIST
Jun. 1983 122 p
(ESA-PSS-01-603-Issue-1; ISSN-0379-4059) Avail: NTIS HC A06/MF A01

A list of preferred components to be used in the selection, procurement and application of components for European Space Agency (ESA) spacecraft and associated equipment is given. The purpose is to provide equipment manufacturers and designers of ESA equipment with a list of electronic components considered

acceptable to ESA and thus to promote the use of standard components. R.J.F.

N84-25870# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LA RECHERCHE AEROSPATIALE, BIMONTHLY BULLETIN, NO. 1983-6, 217/NOVEMBER-DECEMBER
Claude Sevestre, ed. Apr. 1984 61 p refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimensuel, No. 1983-6, 217/Nov.-Dec. (Paris), 1983
(ESA-TT-841) Avail: NTIS HC A04/MF A01; HC available at ONERA, Paris FF 55; original report in FRENCH available at ONERA, Paris FF 60

Various topics of concern to aerospace engineering are addressed. Nonlinear sampled-data control systems, noise fields generated by launch vehicles, pressure transducers for cryogenic wind tunnels, structural vibration testing, and the structural analysis of laminated plates are discussed. For individual titles, see N84-25871 through N84-25875.

N84-25871# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ROBUSTNESS QUANTIFICATION FOR NONLINEAR SAMPLED-DATA SYSTEMS WITH DYNAMIC MULTIPLICATIVE PERTURBATIONS c63
Y. Joannic and O. Mercier *In its* La Rech. Aerospatiale, Bimonthly Bull., No. 1983-6, 217/Nov.-Dec. Apr. 1984 p 1-16 refs (For primary document see N84-25870 16-31)
Avail: NTIS HC A04/MF A01; HC available at ONERA, Paris FF 55; original report in FRENCH available at ONERA, Paris FF 60

Feedback control gains are always computed on the basis of a nominal or average condition for the controlled system. Yet this system is subjected to model variations or mismatches which, combining with attenuation and phase shifts caused by actuators and measuring units, may destabilize the overall regulation. For a given regulator, quantification of admissible perturbations or verifications of a residual stability margin, while accounting for dynamic multiplicative perturbations in the feedback loops, are of extreme importance for the design of multivariable flight controllers of advanced aircraft, whose dynamics are both strongly nonlinear and variable from one point to another of the flight domain. A discrete-time nonlinear system is considered which is subjected to dynamic additive and multiplicative disturbances, the latter kind being modelled by convolution operators (described by transfer matrices in z). Starting with a stability theorem, extending Lyapunov's theory to recurrent systems with convolution operators, structural robustness theorems are established, allowing quantitative measurement of stability margins. More specific results are given with respect to linear-quadratic regulators: they permit evaluation of the multivariable gain and phase margins, in the discrete frequency domain. Altogether, they complement other recently obtained results, dealing with continuous-time feedback control systems. M.G.

N84-25872# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ANALYSIS OF THE SOUND FIELD RADIATED BY THE ARIANE LAUNCH VEHICLE DURING LIFT-OFF c71
S. Candel (Ecole Centrale des Arts et Manufactures) *In its* La Rech. Aerospatiale, Bimonthly Bull., No. 1983-6, 217/Nov.-Dec. Apr. 1984 p 17-33 refs (For primary document see N84-25870 16-31)
Avail: NTIS HC A04/MF A01; HC available at ONERA, Paris FF 55; original report in FRENCH available at ONERA, Paris FF 60

A basis for analyzing the acoustical environment created by the Ariane launch vehicles is presented. The noise sources and the principal phenomena determining the sound field structure are first described, followed by a detailed dimensional analysis of the sound radiated from the high-speed jets. This analysis serves as the basis for the sound field computational model. Calculation results for the Ariane 1 launcher are then presented, illustrating some of the capabilities of the model. M.G.

N84-25873# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CHARACTERIZATION OF PRESSURE TRANSDUCERS FOR FUTURE CRYOGENIC WIND TUNNELS c35
M. Portat and F. Helias *In its* La Rech. Aerospatiale, Bimonthly Bull., No. 1983-6, 217/Nov.-Dec. Apr. 1984 p 35-40 (For primary document see N84-25870 16-31)
Avail: NTIS HC A04/MF A01; HC available at ONERA, Paris FF 55; original report in FRENCH available at ONERA, Paris FF 60

Operating cryogenic wind tunnels will require measurement equipment adapted to the specific environmental conditions. Among other things, it must be known how the existing wind tunnel pressure transducers will behave in a cryogenic environment. To this end, ONERA has developed special instruments to measure pressure transducer characteristics accurately between 300 and 120 K. Static tests carried out on the Kulite XCQL and ONERA 20H130 transducers show that they are usable at 120 K. M.G.

N84-25874# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Structures Dept.
DEVELOPMENTS IN STRUCTURAL VIBRATION TESTING METHODS c39
R. Dat *In its* La Rech. Aerospatiale, Bimonthly Bull., No. 1983-6, 217/Nov.-Dec. Apr. 1984 p 41-56 refs (For primary document see N84-25870 16-31)
Avail: NTIS HC A04/MF A01; HC available at ONERA, Paris FF 55; original report in FRENCH available at ONERA, Paris FF 60

The vibration testing methods used to determine the modal characteristics of structures are reviewed. The integration of mini-computers into the testing instrumentation has resulted in the development of new methods that make it possible to use a set of frequency or impulse responses of the structure to a non-appropriate excitation. A significant reduction in the test duration and structure immobilization is thus achieved. The difficulties due to the presence of structural nonlinearities are examined. M.G.

N84-25875# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
A NONLINEAR MODEL OF LAMINATED PLATE, USING COMBINED VARIABLES c39
Th. Nevers and R. Girard *In its* La Rech. Aerospatiale, Bimonthly Bull., No. 1983-6, 217/Nov.-Dec. Apr. 1984 p 57-59 refs (For primary document see N84-25870 16-31)
Avail: NTIS HC A04/MF A01; HC available at ONERA, Paris FF 55; original report in FRENCH available at ONERA, Paris FF 60

The number of variational principles introduced in mechanics has made it possible to deal with plates in a number of ways. In the linear domain, the kinematic approach, with its well-established mathematical framework, favors displacements, but the continuity of the stress vector F is not certain even when the transverse shears are taken into account. Inversely, the dual approach sacrifices the continuity in the displacements to obtain the continuity of F. The nonlinear analysis, generally based on Von Karman's equations, contains the same incompatibility. A new variational formulation involving the choice of the unknowns makes it possible to satisfy the various continuities of the linear theory. A nonlinear model taking the transverse shears into account is proposed. By an appropriate choice of the kinetic and static unknowns, the continuity of the displacements and of the linearized tangential stress vector is assured through the interfaces. The equilibrium equations are also satisfied in the plate plane. M.G.

N84-25876# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmens Bereich Raumfahrt.
KUWAIT, PHASE 3/STAGE 1: APPLICATION AND TEST PROGRAM FOR THE SULAIBYAH FOOD/WATER/POWER SYSTEM Final Report, Sep. 1982

Helmut Zewen, Guenther Schmidt, and Walter Oechslein Bonn Bundeministerium fuer Forschung und Technologie Jan. 1984 91 p refs Sponsored by Bundeministerium fuer Forschung und Technologie
(BMFT-FB-T-84-024; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19

Operational tests of the components of a solar thermal power station in the 100 kW (sub e)/700 kW (sub th) power range as well as the connection of the first electrical users to the power station are reported. Performance tests of the collector field, the thermal storage, the energy conversion system, and the control of the system operational experiences and results of the solar thermal power station connection of electrical users to the power station are described. The performance measurements demonstrated the requested mechanical and electrical readiness of the power station. The following operational test phase covered a period of appr. 2 years. The other components belonging to the research program, e.g. the weather station and the data acquisition system were delivered and installed on time and are working properly. Additional electrical users are a brackish water submersible pump set, as well as a reverse osmosis desalination unit. The Kuwaiti partner (KISR) was introduced in the operation of the power station. Since the beginning of 1982, the power station is operated mainly by Kuwaiti staff members. Author

N84-25877# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HYDRAULIC PRESSES
B. V. Rozanov 9 Mar. 1984 882 p Transl. into ENGLISH from the book "Gidravlicheskiye Pressy" Moscow, 1959 431 p
(AD-A139822; FTD-ID(RS)T-1207-83) Avail: NTIS HC A99/MF A01 CSCL 13/9

The operations of hydraulic presses are discussed. Forging, stamping, blanking, and bar presses are discussed. Methods by which the dynamics of presses and the strength of their basic parts are calculated. R.J.F.

N84-25878# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
INTEGRATED SYSTEMS OF MANUFACTURE (ROBOTICS) TECHNOLOGY WORKING GROUP REPORT (IDA/OSD RAND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY) Final Report, Aug. 1982 - Aug. 1983
J. H. Bosworth Nov. 1983 399 p
(Contract MDA903-79-C-0018)
(AD-A140304; AD-E500635; IDA-D-34; IDA/HQ-83-28250) Avail: NTIS HC A17/MF A01 CSCL 06/4

This document records the activities and presents the findings of the Integrated Systems of Manufacture (Robotics) Technology Working Group, part of the IDA/OSD Reliability and Maintainability Study during the period from July 1982 through August 1983. GRA

N84-25879# Centec Consultants, Inc., Reston, Va.
NAVY ELECTROPLATING POLLUTION CONTROL TECHNOLOGY ASSESSMENT MANUAL Final Report, Feb. - Aug. 1983
G. C. Cushnie, Jr. Port Hueneme, Calif. Naval Civil Engineering Lab. Feb. 1984 256 p
(Contract F08635-81-C-0258; F65559)
(AD-A140336; NCEL-CR-84.019) Avail: NTIS HC A12/MF A01 CSCL 13/2

The report provides information on more than 27 separate technologies encompassing conventional treatment, alternate treatment, material recovery techniques and processes and new plating bath formulations. In addition, the incorporation of a section on in-plant process changes enhances the usefulness of the product in that it highlights noncapital-intensive changes to current practices and/or processes that may have significant bearing on reducing overall chemical and water usage costs as well as consequent wastewater treatment needs and disposal costs. This document was prepared as a joint Air Force-Navy effort. It is intended to serve as a guide for technical personnel making decisions on an appropriate means of meeting effluent limits. The selection of any of the described technologies should be done only after a rigorous identification of site requirements has been performed. Author (GRA)

N84-25880# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.
HIGH-STRENGTH CONCRETE FOR PEACEKEEPER FACILITIES Final Report
Kenneth L. Saucier Mar. 1984 64 p
(AD-A140510; WES/MP/SL-84-3; CTIAC-70) Avail: NTIS HC A04/MF A01 CSCL 11/2

An investigation is described which was conducted to determine the processes and techniques required to produce portland-cement concrete with a compressive strength of 15,000 psi or greater using conventional concreting methods and equipment, and to develop physical property data on the mixtures. It was permitted that special materials and admixtures be used, but a requirement was set that the aggregates and cements be selected from those available in the Cheyenne, Wyoming, area. Results indicated that it is feasible to achieve the 15,000-psi compressive strengths but that workability may decrease over a 2-hour period, and this latter development should be studied under job conditions. It is recommended that: (1) all materials and procedures to be used on a specific project be tested in the laboratory for basic property information, and (2) selected mixtures be tested in the field under expected environmental conditions prior to actual job use. GRA

N84-25881# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
THE REPAIR AND MODIFICATION OF PRINTED-CIRCUIT BOARDS AND SOLDER JOINTS FOR SPACE USE
Feb. 1983 58 p
(ESA-PSS-01-728-Issue-1; ISSN-0379-4059) Avail: NTIS HC A04/MF A01

The repair and modification procedures detailed in this specification are designed to maintain the rigorous standards set by ESA for the manufacture and assembly of space quality printed circuit boards. Author

N84-25882# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
THE CLEANING OF GUIDE-SPACE D96 TAPE
Dec. 1982 20 p
(ESA-PSS-01-732-Issue-1; ISSN-0379-4059) Avail: NTIS HC A02/MF A01

This specification describes a standard process that reduces the high level of outgassing of GUIDE-SPACE D96 (lacing tape) in the as received condition, to a level acceptable for general spacecraft applications. The treatment has no significant effect on other properties of this material. Author

N84-25883# Goodell-Grivas, Inc., Southfield, Mich.
ACCIDENT SURROGATES FOR USE IN ANALYZING HIGHWAY SAFETY HAZARDS. VOLUME 1: EXECUTIVE SUMMARY Final Report, Sep. 1978 - Jul. 1982
Aug. 1983 19 p refs
(Contract DOT-FH-11-9492)
(PB84-174739; FHWA/RD-82/103) Avail: NTIS HC A02/MF A01; also available in set of 3 reports HC E99 CSCL 13B

The objective of the research project was to investigate the feasibility of using accident surrogate measures in highway safety analyses. An accident surrogate measure is defined as a quantifiable observation that can be used in place of or as a supplement to accident records. The study provides evidence that surrogate measures for accident experience can be identified. A procedure for developing and using accident surrogates is presented. Analyses were performed to develop such measures for hazardous location identification and countermeasures evaluation at rural isolated curves on two-lane roads, rural signalized intersections and two-lane tangent sections in urbanized areas. GRA

N84-25884# Goodell-Grivas, Inc., Southfield, Mich.
ACCIDENT SURROGATES FOR USE IN ANALYZING HIGHWAY SAFETY HAZARDS, VOLUME 2 Final Report, Sep. 1978 - Jul. 1982
T. K. Datta, D. D. Perkins, J. I. Taylor, and H. T. Thompson Aug. 1983 80 p refs
(Contract DOT-FH-11-9492)
(PB84-174747; FHWA/RD-82/104-Vol-2) Avail: NTIS HC A05/MF A01; also available in set of 3 reports HC E99 CSCL 13B

This study investigates the feasibility of using accident surrogate measures in highway safety analyses. This report is the second in a series. GRA

N84-25885# Goodell-Grivas, Inc., Southfield, Mich.
ACCIDENT SURROGATES FOR USE IN ANALYZING HIGHWAY SAFETY HAZARDS. VOLUME 3: APPENDICES A-G Final Report, Sep. 1978 - Jul. 1982
T. K. Datta, D. D. Perkins, J. I. Taylor, and H. T. Thompson Aug. 1983 179 p refs
(Contract DOT-FH-11-9492)
(PB84-174754; FHWA/RD-82/105-Vol-3-App-A-G) Avail: NTIS HC A09/MF A01; also available in set of 3 reports HC E99 CSCL 13B

This study investigates the feasibility of using accident surrogate measures in highway safety analyses. This report is the third in a series. GRA

N84-25886# National Bureau of Standards, Washington, D.C. National Engineering Lab.
THERMAL ACTUATION OF EXTINGUISHING SYSTEMS
David D. Evans Mar. 1984 29 p refs
(PB84-177156; NBSIR-83-2807) Avail: NTIS HC A03/MF A01 CSCL 13K

A brief review of the Response Time Index (RTI) method of characterizing the thermal response of commercial sprinklers and heat detectors is presented. Measured ceiling layer flow temperature and velocity histories from a bedroom fire test are used to illustrate the use of RTI in calculating sprinkler operation times. In small enclosure fires, a quiescent warm gas layer confined by the room walls may accumulate below the ceiling before sprinkler operation. The effects of this warm gas layer on the fire plume and ceiling jet flows are accounted for by substitution of an equivalent point source fire. Encouraging agreement was found between measured ceiling jet temperatures from steady fires in a laboratory scale cylindrical enclosure put into dimensionless form based on parameters of the substitute fire source, and existing empirical correlations from fire tests in large enclosures in which a quiescent warm upper gas layer does not accumulate.
Author (GRA)

N84-25887# California Inst. of Tech., Pasadena. Earthquake Engineering Research Lab.
DYNAMIC ANALYSIS OF FLUID-STRUCTURE SYSTEMS Ph.D. Thesis
Ahmed Rashed 1983 239 p refs
(Grant NSF CEE-81-19962)
(PB84-162916; EERL-82-03) Avail: NTIS HC A11/MF A01 CSCL 13B

Theoretical investigations of the dynamic behavior of some important fluid structure systems are conducted to seek a better understanding of the hydrodynamic pressures generated in the fluid as a result of both the rigid body and the vibrational motions of the structure, and the effects of the fluid on the dynamic properties of the structure as well as on its response to earthquake ground motions. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-25888 Polish Academy of Sciences, Warsaw. Dept. of Electromagnetic Waves Theory.
THE EXACT SURFACE IMPEDANCE APPROACH TO PROBLEMS OF DIFFRACTION IN OPEN WAVEGUIDES
Wojciech Nasalski 1984 24 p refs
Avail: Issuing Activity

An exact approach to diffraction problems for open planar waveguides is described. This is based on total field analysis instead of on a model-matching technique. Within it, the rigorous impedance boundary condition is derived in integral form suitable for further treatment of the problem by Wiener-Hopf methods. As an example, the problem of guided and leaky mode scattering at a junction between two planar, isotropic, symmetric waveguides is considered. The Wiener-Hopf-Hilbert method is used and an exact, closed-form solution is obtained. Possible applications in integrated optics are indicated. M.G.

N84-25889*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TELECOMMUNICATIONS AND DATA ACQUISITION REPORT Progress Report
E. C. Posner, ed. 15 Mar. 1984 164 p refs
(NASA-CR-173565; NAS 1.26:173565; TDA-PR-42-77) Avail: NTIS HC A08/MF A01 CSCL 17B

Activities in space communication, radio navigation, radio science, and ground-based astronomy are reported. Advanced systems for the Deep Space Network and its Ground-Communications Facility are discussed including station control and system technology. Network sustaining as well as data and information systems are covered. Studies of geodynamics, investigations of the microwave spectrum, and the search for extraterrestrial intelligence are reported. For individual titles, see N84-25890 through N84-25905.

N84-25890*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Application Section.
ARCSECOND POSITIONS FOR MILLIARCSECOND VLBI NUCLEI OF EXTRAGALACTIC RADIO SOURCES, PART 2: 207 SOURCES c93
D. D. Morabito, R. A. Preston, M. A. Slade, D. L. Jauncey (CSIRO, Sydney), and G. D. Nicolson (CSIR, Johannesburg) *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 1-11 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 20N

Very long base interferometry measurements of time delay and fringe frequency at 2.29 GHz on baselines of 10,000 km between Deep Space Network stations were used to determine the positions of the milliarcsecond nuclei in 207 extragalactic radio sources. Estimated accuracies generally range from approximately 0.1 to approximately 1.0, in both right ascension and declination, with all sources having uncertainties $< 4'$ in both coordinates. The observed sources are part of an all-sky VLBI catalog of milliarcsecond radio sources. Arcsecond positions are now determined for 752 of these sources. Arcsecond positions serve as a useful starting point in the construction of high-precision VLBI reference frames and are also important for unambiguous determination of optical counterparts to compact radio sources.
Author

N84-25891*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Section.
SUBMILLIARCSECOND VLBI OBSERVATIONS OF THE CLOSE PAIR GC 1342+662 AND GC 1342+663 c90
D. D. Morabito *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 12-18 refs (For primary document see

N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 03B

Differential VLBI was simultaneously performed on the source pair GC 1342+662 and GC 1342+663 (4.4-arcminute separation) using S-band on the Goldstone/Madrid baseline. These measurements were acquired on two separate observing sessions: 30 December 1982 and 14 May 1983. The change in separation of GC 1342+662 relative to GC 1342+663 between the two epochs was 0.03 + or 0.08 milliarcsecond. The differences of the relative position measurements between epochs of GC 1342+662 relative to GC 1342+663 were -0.29 + or - 0.05 milliarcsecond in right ascension and 0.14 + or - 0.09 milliarcsecond in declination. These measurements demonstrate submilliarcsecond accuracy and repeatability. The discrepancies outside of the formal uncertainties could be attributed to the intrinsic properties of the sources such as structure and to a lesser probability, proper motion. These discrepancies could also be attributed to excursions in UT1-UTC of about four times the quoted BIH uncertainty. Author

N84-25892*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
MAGNETICALLY ENHANCED HYDROGEN GAS DISSOCIATOR: A PROGRESS REPORT **c35**
G. Lee, T. K. Tucker, and L. Mateki *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 19-23 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 14B

The application of a sensitive hydrogen gas detector led to the observation of a significant increase in the efficiency of atom production of a magnetically enhanced dissociator. An increase of about 7000% in the production of atoms in the hyperfine state desired for maser operation is observed at certain values of the applied magnetic field. A preliminary test of the dissociator in the maser led to an observed increase of 6.18 dB in the maser power. Author

N84-25893*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Telecommunications Systems Section.
X-BAND UPLINK TECHNOLOGY DEMONSTRATION AT DSS-13
J. G. Meeker and C. T. Timpe *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 24-32 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 17B

The status of the X-band uplink development program is examined from a systems' viewpoint. The hardware, designed and built under the program, is now in place at DSS-13. System stability testing is underway. An X-band receive capability is being implemented on both the Galileo and the Venus Radar Mapper spacecraft. Experiments are planned to demonstrate the capabilities of the X-band uplink system and to permit performance of the gravitational wave experiment on the Galileo orbiter and obtain a more detailed gravity map of Venus. A.R.H.

N84-25894*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
EFFECTS OF NRZ-M MODULATION ON CONVOLUTIONAL CODES PERFORMANCE **c17**
L. J. Deutsch, F. Pollara, and L. Swanson *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 33-40 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 09F

Non-return-to-zero mark (NRZ-M) modulation is often used to resolve data sense in suppressed carrier telemetry systems because such systems are subject to half cycle slips that result in complementing the encoded data stream. The performance of coded telemetry systems with NRZ-M is sensitive to the order in which the various operations are done. A system that demodulates the NRZ-M waveform and then decodes performs differently from a system that does the decoding first. The performance of the NASA standard (7, 1/2) convolutional codes is determined for several systems using NRZ-M. Several different demodulation schemes for NRZ-M are considered. It is shown that, even for the best soft-decision method examined, there is a 2.7 dB loss at a decoded bit error rate of 0.005 if the NRZ-M demodulation occurs before rather than after Viterbi decoding. Author

N84-25895*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
NEW SHORT CONSTRAINT LENGTH, RATE 1/N CONVOLUTIONAL CODES WHICH MINIMIZE REQUIRED E SUB b/N SUB o FOR GIVEN BIT ERROR RATE
P. J. Lee *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 41-56 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 17B

Instead of using the criterion of maximum free distance, (df) or the maximum (df) with minimizing a few first distance profiles, short constraint length rate 1/N convolution codes were searched using a criterion of minimizing required bit energy-to-noise density ratio, E(b)/N(o), for a given value of desired bit error rate (BER), for the goodness of a code. The considered channel was binary antipodal signaling over additive white Gaussian noise and no quantization at the channel output. For the BER calculations, the transfer function bounding technique was used. Partial searches were performed using some known facts and a very useful idea that 'good codes generate good codes." That is, for a given constraint length K, good rate 1/(N + 1) codes can be found by extending the code generator matrices of good rate 1/N codes. The code search results are tabulated for 3 < or = K < or = 7 and 2 < or = N < or = 8. For many pairs of K and N, the new codes are shown to save 0.1 to 0.4 dB in the required E(b)/N(o) compared to previously reported codes. Additionally, the benefits of coding bandwidth expansion are confirmed with the new codes. Author

N84-25896*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
AN EASY-TO-IMPLEMENT CODING SCHEME FOR MULTIFREQUENCY PPM
R. J. McEliece and L. Swanson *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 57-63 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 17B

In implementing multifrequency PPM, a naturally arising question is: Let P be a fixed number; among all integer valued processes X1, X2, X3, with E ([X(n+1)-X(n)] squared) less than or = P, which has the largest entropy? Earlier work by McEliece and Rodemich answered this question, but there is no obvious way to use this process to implement a code for multifrequency PPM. The present article describes an easy-to-implement process X1, X2, with E ([X(n+1)-X(n)] squared) less than or = P, whose entropy is nearly as great as that of the McEliece-Rodemich process. Author

N84-25897*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Radio Frequency and Microwave Subsystem Section.
DSS 13 MICROPROCESSOR ANTENNA CONTROLLER **c60**
R. M. Gosline *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 64-74 (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 09B

A microprocessor based antenna controller system developed as part of the unattended station project for DSS 13 is described. Both the hardware and software top level designs are presented and the major problems encounted are discussed. Developments useful to related projects include a JPL standard 15 line interface using a single board computer, a general purpose parser, a fast floating point to ASCII conversion technique, and experience gained in using off board floating point processors with the 8080 CPU. Author

N84-25898*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Office of Telecommunications and Data Acquisition.
TDA ASSESSMENT OF RECOMMENDATIONS FOR SPACE

DATA SYSTEM STANDARDS c82
E. C. Posner and R. Stevens *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 75-85 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 05B

NASA is participating in the development of international standards for space data systems. Recommendations for standards thus far developed are assessed. The proposed standards for telemetry coding and packet telemetry provide worthwhile benefit to the DSN; their cost impact to the DSN should be small. Because of their advantage to the NASA space exploration program, their adoption should be supported by TDA, JPL, and OSTDS. A.R.H.

N84-25899*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
GOLDSTONE R/D HIGH SPEED DATA ACQUISITION SYSTEM
L. J. Deutsch, R. F. Jurgens, and S. S. Brokl *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 87-96 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 17I

A digital data acquisition system that meets the requirements of several users (initially the planetary radar program) is planned for general use at Deep Space Station 14 (DSS 14). The system, now partially complete, is controlled by VAX 11/780 computer that is programmed in high level languages. A DEC Data Controller is included for moderate-speed data acquisition, low speed data display, and for a digital interface to special user-provided devices. The high-speed data acquisition is performed in devices that are being designed and built at JPL. Analog IF signals are converted to a digitized 50 MHz real signal. This signal is filtered and mixed digitally to baseband after which its phase code (a PN sequence in the case of planetary radar) is removed. It may then be accumulated (or averaged) and fed into the VAX through an FPS 5210 array processor. Further data processing before entering the VAX is thus possible (computation and accumulation of the power spectra, for example). The system is to be located in the research and development pedestal at DSS 14 for easy access by researchers in radio astronomy as well as telemetry processing and antenna arraying. Author

N84-25900*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
DEMODULATOR AND ACCUMULATOR FOR THE HIGH-SPEED DATA ACQUISITION SYSTEM
S. S. Brokl *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 97-103 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 09C

In support of nonflight project data acquisition, a high speed data acquisition system was designed. The demodulator and accumulator modules at the heart of this system perform the detection and prefiltering of data which are then further processed by a floating point systems 5210 array processor. Block diagrams of the demodulator and accumulator modules are presented. A.R.H.

N84-25901*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Telecommunications Systems Section.
EFFECT OF RF FILTERING ON THE PERFORMANCE OF UNCODED PCM/PM TELEMETRY CHANNELS c17
M. A. Koerner *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 104-125 ref (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 09F

A method for calculating the increase in received telemetry signal power required to compensate for the use of a radio frequency interference (RFI) filter in front of the DSN receiving system low-noise amplifier is described. The telemetry system for which the degradation is calculated is an uncoded PCM/PM system in which the NRZ data directly modulates the carrier at a modulation level which leaves a discrete carrier. A phase-locked loop in the RF receiver tracks the discrete carrier and coherently demodulates the PCM data. The RFI filter may be a series of Butterworth, Tchebychev, or Bessel low-pass, high-pass, band-pass, or band-reject filters, each with arbitrary bandwidth, number of poles, and, for band-pass or band-reject filters, resonant frequency. The only restriction is that the RFI filter must have only simple poles. Numerical results are presented for the RFI filters the DSN plans to place in front of the S-band FET, S-band maser, and X-band maser low noise amplifiers. The main conclusion is that the filters will produce negligible degradation at data rates below 4 Mbps. Author

N84-25902*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
TIME INTERVAL ERRORS OF A FLICKER-NOISE GENERATOR c35
C. A. Greenhall *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 126-135 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 14B

Time interval error (TIE) is the error of a clock at time t after it is synchronized and syntonized at time zero. Previous simulations of Flicker FM noise yielded a mean-square TIE proportional to sq t. It is shown that the order of growth is actually sq t log t. The earlier sq t result is explained and a modified version of the Barnes-Jarvis simulation algorithm is given. Author

N84-25903*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Office of Telecommunications and Data Acquisition.
MINIMUM-DISTANCE PROBLEMS IN PROTOCOL DESIGN c60
E. C. Posner and Z. Reichstein (California Inst. of Technology) *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 136-143 (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 09B

Codes for use in personal computer file transfer as control characters, when only upper-case ASCII can be used to avoid dependence on unique machine features and promote portability. If ten control functions are needed, a number used in at least one protocol, a subset of ten upper-case ASCII characters with good distance properties is sought. The control functions form themselves naturally into three groups, one of two functions (ACK and NAK) and two of four. The aim is to make ACK and NAK as antipodal as possible (distance 6), make the distances within each of the other groups as large as possible (4), and otherwise have as few 2's in the distance table as possible, recognizing that only even distances can occur. The minimum and an assignment that attains the minimum are found. The code is essentially unique. The analogous problem for two groups of three control functions and one group of four is also solved. Author

N84-25904*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Atmospheric Sciences Section.
NOTE ON THE OPTIMUM SEARCH STRATEGY FOR UNIFORMLY DISTRIBUTED CW TRANSMITTERS
S. Gulkis *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 144-150 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 20N

The relative probability of detecting randomly distributed CW transmitters as a function of the fraction of the sky which is searched (in a fixed time) is given. It is shown that the probability of detecting such a class of transmitters with a given receiving system is a maximum if the entire sky is searched. The particular case of a search in which the number of directions searched is equal to the telescope gain and the integration time per beam element is equal to the reciprocal of the channel bandwidth is discussed. Author

N84-25905*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN INVESTIGATION OF THE EFFECTS OF SCAN SEPARATION ON THE SENSITIVITY OF THE SETI ALL SKY SURVEY FOR THE CASE OF GAUSSIAN NOISE
A. Lokshin and E. T. Olsen *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 151-158 refs (For primary

document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 20N

The scalloping problem for the case of Gaussian noise statistics is analyzed. The optimal weighting strategy for linearly combining two observations in adjacent beam areas is derived, and the sensitivity and scalloping for this weighting strategy are compared with those realized using a single observation or using equal weighting of two observations. The variation of the probability for detecting ETI signals with scan separation are calculated for the various weighting strategies, assuming that the transmitters are of equal strength and are uniformly distributed throughout space. A.R.H.

N84-25906# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SATELLITE COMMUNICATION, PART 2
Vishwanath Sinha May 1984 24 p refs Submitted for publication
(INPE-3107-PRE/506) Avail: NTIS HC A02/MF A01

Satellite communication at an introductory level is discussed. Various multiple accessing techniques are outlined. FDMA and TDMA techniques are treated in some detail. Brief descriptions of various factors influencing a satellite orbit and earth terminals for satellite communication are discussed. Author

N84-25907*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CORRELATED MEASUREMENTS OF UHF RADAR SIGNATURES, RF RADIATION AND ELECTRIC FIELD CHANGES FROM LIGHTNING
D. M. LeVine and Vladislav Mazur (Oklahoma Univ., Norman) [1983] 11 p refs
(Contract NCC5-600)
(NASA-TM-84425; NAS 1.15:84425) Avail: NTIS HC A02/MF A01 CSCL 20N

During Storm Hazards - 82, simultaneous measurements are made of radar echoes, fast and slow field changes and RF radiation from lightning. Radio frequency radiation and radar echoes are also obtained during periods when the research aircraft is struck by lightning. These data are presently used to better understand the electrical processes which occur during strikes to the aircraft. Preliminary conclusions verify that the events recorded aboard the aircraft occurred during lightning but also indicate that they occur with surprising frequency very early in the flash. M.A.C.

N84-25908*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DETERMINATION OF THE KEY PARAMETERS AFFECTING HISTORIC COMMUNICATIONS SATELLITE TRENDS
David Namkoong Jun. 1984 13 p refs
(NASA-TM-83633; E-2072; NAS 1.15:83633) Avail: NTIS HC A02/MF A01 CSCL 17B

Data representing 13 series of commercial communications satellites procured between 1968 and 1982 were analyzed to determine the factors that have contributed to the general reduction over time of the per circuit cost of communications satellites. The model by which the data were analyzed was derived from a general telecommunications application and modified to be more directly applicable for communications satellites. In this model satellite mass, bandwidth-years, and technological change were the variable parameters. A linear, least squares, multiple regression routine was used to obtain the measure of significance of the model. Correlation was measured by coefficient of determination (R super 2) and t-statistic. The results showed that no correlation could be established with satellite mass. Bandwidth-year however, did show a significant correlation. Technological change in the bandwidth-year case was a significant factor in the model. This analysis and the conclusions derived are based on mature technologies, i.e., satellite designs that are evolutions of earlier designs rather than the first of a new generation. The findings, therefore, are appropriate to future satellites only if they are a continuation of design evolution. Author

N84-25909*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SECONDARY PATTERN COMPUTATION OF AN ARBITRARILY SHAPED MAIN REFLECTOR
Peter T. C. Lam (Illinois Univ., Urbana), S. W. Lee (Illinois Univ., Urbana), and R. Acosta Apr. 1984 127 p refs
(Grant NAG3-419)
(NASA-TM-85527; NAS 1.15:85527; ELSR-84-7; UILU-ENG-84-2547) Avail: NTIS HC A07/MF A01 CSCL 20N

The secondary pattern of a perfectly conducting offset main reflector being illuminated by a point feed at an arbitrary location was studied. The method of analysis is based upon the application of the Fast Fourier Transform (FFT) to the aperture fields obtained using geometrical optics (GO) and geometrical theory of diffraction (GTD). Key features of the reflector surface is completely arbitrary, the incident field from the feed is most general with arbitrary polarization and location, and the edge diffraction is calculated by either UAT or by UTD. Comparison of this technique for an offset parabolic reflector with the Jacobi-Bessel and Fourier-Bessel techniques shows good agreement. Near field, far field, and scan data of a large reflector are presented. Author

N84-25910# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
EMV NORMS: INTRODUCTION TO THE NORMS OF ELECTROMAGNETIC ACCOMODATION [EMV-NORMEN. EINFUEHRUNG IN DIE NORMEN DER ELEKTROMAGNETISCHEN VERTRAEGLICHKEIT]
R. Harms 1983 29 p ref In GERMAN Presented at ATE Conf., Esslingen, West Germany, 20-21 Jun. 1983
(MBB-UR-652-83-O) Avail: NTIS HC A03/MF A01

Standards for electromagnetic measurements, measured by frequency range and radiation interference were compared. Different measuring methods were tested. It is found that most cases of correction value measurement yield results can be converted. All valuable standards originate in manual measurements. Signal identification methods are not yet automated. The present instrument technique which has built in processors and connected computers, still need software changes and the tolerance characteristics still have to be defined. Transl. by E.A.K.

N84-25911# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
ERROR MARGINS BY SEGMENTATION OF SPEECH SIGNALS WITH AUTOCORRELATION PROCEDURES FOR LINEAR PREDICTION CODING SYSTEMS [FEHLERGRENZEN BEI DER SPRACHSIGNALSEGMENTIERUNG MIT AKF FUER LPC-SYSTEME]
H. J. Braun, C. Fleischmann, and M. Koerkel Nov. 1983 36 p refs In GERMAN; ENGLISH summary
(FI-13-TBr-17) Avail: NTIS HC A03/MF A01

Systems used to code speech signals with very low bit rates are realized as VOCODER systems. The systems require a reliable decision whether, in short term intervals, the speech signal has a pulse or a noise like characteristic. This decision allows the speech signal to be segmented into such classes. The pulse frequency is determined in the pulse like intervals. Different segmentation procedures including the effect of mixing the original signal with the inversely filtered original signal are investigated. The segmentation procedures are based on the autocorrelation of nonlinearly distorted signals. The quality of the different segmentation procedures is objectively determined by reference measurements using an optimally segmented reference pattern. E.A.K.

N84-25912# Centro Informazioni Studi Esperienze, Milan (Italy). Servizio Documentazione.
MICROWAVE DETECTION OF SURFACE AND VOLUME MOISTURE IN BUILDING WALLS AND RELATED STRUCTURES [RILEVAZIONE A MICROONDE DELL UMIDITA DI SUPERFICIE E DI VOLUME DI STRUTTURE MURARIE E AFFINI]
E. M. Bastida and A. M. Ricca 1983 13 p refs In ITALIAN; ENGLISH summary Presented at 1st Intern. Conf. on Prove Nondistruttive nella Conservazione delle Opere d'Arte, Rome,

27-29 Oct. 1983 Sponsored by Ente Nazionale per l'Energia Electricca and European Nuclear Energy Agency
(CISE-2111) Avail: NTIS HC A02/MF A01

Microwave technique for non-contacting volume and surface moisture measurements in concrete and building walls is described. The reflection and attenuation coefficients of an electromagnetic wave, in the microwave spectrum region, impinging upon a humid wall are studied. Reflection and attenuation are related to the water content. The attenuation coefficient is related to the space-average humidity, while reflection measurements depend also on the humidity profile. By means of a computer simulation surface humidity and surface humidity gradient are both measured by reflectometric techniques. Combining reflection and attenuation measurements, information about the humidity profile is obtained in a non-contacting way. Experimental results on reflection and attenuation measurements are also presented. Author

N84-25913# Battelle Inst., Frankfurt am Main (West Germany).
DESIGN OF A CO2 LASER TRANSCEIVER PACKAGE FOR SPACE-TO-SPACE OPTICAL COMMUNICATION Final Report
W. Englisch Paris ESA Jul. 1983 446 p refs
(Contract ESTEC-4006/79)
(BLeV-R-64.225; ESA-CR(P)-1869) Avail: NTIS HC A19/MF A01

This study presents the detailed design of a CO2 laser transceiver package capable of establishing a two way data link between two geostationary satellites (GEO-GEO) or between an Earth observational satellite in low orbit and a geostationary relay satellite (LEO-GEO) with data rates > or = 1 Gbit/s at a bit error rate < 10 to the minus 6th power. The transceiver package comprises five major subsystems: transmitter, receiver, PAT (point, acquisition, tracking), optics, and mechanical structure. The technical definition of the various subsystems is at the level of components or parts. In addition mathematical models have been developed which are used to evaluate the functional relationships of the various subassemblies, to optimize the design parameters, and to investigate the implications of nonideal performance. B.W.

N84-25914# European Space Agency, Paris (France).
ESTIMATION OF THE PARAMETERS OF AN UNMODULATED CARRIER SIGNAL DISTURBED BY COMPLEX-MULTIPLICATIVE AND ADDITIVE GAUSSIAN NOISE
Franz Edbauer Apr. 1984 189 p refs Transl. into ENGLISH of "Schaetzung der Signalparameter eines Unmodulierten Traegersignals bei Komplex-Multiplikativer und Additiver Gausscher Rauschstoerung" rept. DFVLR-FB-81-23 DFVLR, Oberpfaffenhofen, West Germany, 1981 143 p
(ESA-TT-737; DFVLR-FB-81-23) Avail: NTIS HC A09/MF A01; original German report available from DFVLR, Cologne DM 29,70

Procedures for estimating the channel state and the parameters of an unmodulated carrier reception signal, disturbed by additive noise, were investigated for fast varying Rayleigh and Rice channels. The state of the channel was estimated by means of Kalman filtering. The time-invariant parameters of the channel and the received signal (such as frequency offset, phase, and amplitude of the direct signal component at the time origin), the ratio of the power of the direct component and scattered component, and the fading frequency were determined by maximum likelihood identification. From this information a suboptimum phase-locked loop (PLL) was derived which was matched to the particular channel. The results were achieved analytically and by means of computer simulation. Author

N84-25915# European Space Agency, Paris (France).
ERROR RESPONSE OF A TRAPEZOIDAL PULSES DME TECHNIQUE DISTURBED BY MULTIPATH EFFECTS AND NOISE
Rainer Ullrich May 1983 83 p refs Transl. into ENGLISH of "Fehlerverhalten eines DME-verfahrens mit Trapezimpulsen bei Stoerung durch Mehrwegeeffekte und rauschen" rept. DFVLR-FB-81-34 DFVLR, Brunswick, May 1981 Original language document announced as N82-22420
(ESA-TT-747; DFVLR-FB-81-34) Avail: NTIS HC A05/MF A01; original German report available from DFVLR, Cologne DM 16,10

The influence of multipath disturbances and noise on precision distance measuring equipment (PDME) for aviation, using trapezoidal pulses, was investigated. Usually DME pulses have curved edges, i.e., cosinus and cosinus squared functions. The PDME system with trapezoidal pulses combined with the delay and compare (DAC) trigger method allows for disturbed pulses to show, especially clearly, the dependence of the trigger error on pulse rise time, on the parameters of the triggering method, and on the disturbance. Author (ESA)

N84-25916# European Space Agency, Paris (France).
A MICROWAVE TIME TRANSMISSION SYSTEM
David Hounam, Winfried Poetzsch, and Wilhelm Schwimmer Nov. 1983 59 p refs Transl. into ENGLISH of "Ein Mikrowellensystem zur Zeituebertragung" rept. DFVLR-FB-82-10 DFVLR, Oberpfaffenhofen, West Germany, Mar. 1982
(ESA-TT-782; DFVLR-FB-82-10) Avail: NTIS HC A04/MF A01; original German report available from DFVLR, Cologne DM 22,50

A time transmission system, intended for synchronizing time stations is described. The timing signal is a pseudo noise code, modulated on a carrier in L Band. Coherent reception means small system bandwidth and high sensitivity. A transmitter power of only 1 W and omnidirectional antennas results in a range of over 1000 km. An accuracy of 10 ns for the time measurements was aimed for. The transmission system is also suitable for measuring group delay times. The components of the prototype are described in detail and characteristics such as sensitivity and accuracy are analyzed. Author

N84-25917# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
MAXIMUM LIKELIHOOD DECODING OF AMI-CODED DIGITAL TRANSMISSION AND ADDITIVE GAUSSIAN DISTURBANCE
Guenter Morgenstern Oct. 1983 42 p refs In GERMAN; ENGLISH summary
(FI-44-TBr-91) Avail: NTIS HC A03/MF A01

By the example of the AMI-coded digital signal, the statistical dependence of successive code symbols of redundant digital transmission are used to reduce the error rate occurring in decoding the signal subject to interference. For this purpose, the concepts of the state, the state diagram, the code trellis and the maximum likelihood function are introduced. With respect to the decoding rule resulting from the statistical dependence, it becomes evident that certain code elements are not decoded immediately, but only after the reception of further code elements. It is for this reason that this decoding procedure is called sequential decoding. Since the decoder must be able to store various data for the duration of several code symbols, it may be called decoder with memory. A block diagram of this decoding procedure is included. With the aid of a computer simulation, the error rate is determined as a function of the signal to noise power ratio. Author

N84-25918# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
REDUCTION OF THE STRUT RADIATION OF REFLECTOR ANTENNAS
Herbert Thielen, Volker Hombach, and Wilhelm Busse Jan. 1984 53 p refs In GERMAN; ENGLISH summary
(FI-454-TBr-35) Avail: NTIS HC A04/MF A01

The side lobe level of rotationally symmetric paraboloidal antennas is considerably increased in certain angular regions by the relatively focussed secondary radiation of the feed struts. Various measures for reducing the maximum level of the strut radiation were investigated both theoretically and experimentally. The analytical techniques used to model the strut radiation were the current distribution method (physical optics) and the integral equation method. The experiments were carried out in X band employing a 1.5 m paraboloidal antenna. The most effective measure turned out to be the coating of the feed struts with absorbing material, whereby the side lobe level in the viciuity of the reflection angle of the struts was reduced by approximately 15 dB. Owing to the use of parabolically bent struts, the scattered

radiation was distributed with almost constant level over a large angular range. Author

N84-25919# Naval Postgraduate School, Monterey, Calif.
MULTIPLE PATH STATIC ROUTING PROTOCOLS FOR PACKET SWITCHED NETWORKS M.S. Thesis
H. T. Schiantarelli Sep. 1983 143 p
(AD-A140166) Avail: NTIS HC A07/MF A01 CSCL 17/2

A central issue in the design of a packet switched communications network is the development of an efficient routing protocol, which determines the routes followed by the information as it traverses the network. The performance of a static routing protocol that allows for multiple path routing based on the use of routing fractions, is analyzed using computer simulation. Comparison is made between the performance of this protocol and that of a minimum number of hops routing protocol. Routing fractions calculated by two different methods are used and their relative performance analyzed. A comparative analysis is done of the performance of the protocol when using virtual circuit service and datagram service in the network. Provision is made to extend use of the simulation program to analyze dynamic routing cases using routing fractions. Author (GRA)

N84-25920# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RADOMES FOR FLIGHT VEHICLES
B. A. Prigoda and V. S. Kokunko 26 Mar. 1984 6 p Transl. into ENGLISH from mono. "Obtekateli Antenn Letatelnykh Appartov" Moscow, Mashinostroyeniye, 1970 p 70-73
(AD-A140174; FTD-ID(RS)T-0398-84) Avail: NTIS HC A02/MF A01 CSCL 09/5

The dielectric properties, structural stability, and structural design of a thin walled aircraft radome supported by a metal frame are considered. Radio transmittance and structural weight are emphasized. The theory of long lines facilitates finding a path for lowering the weight of the walls while preserving their radio-engineering characteristics. R.S.F.

N84-25921# Federal Communications Commission, Washington, D. C. Office of Science and Technology.
ADVANCED TECHNOLOGY UHF RECEIVER STUDY. PART 2: EFFECT ON UHF TELEVISION ALLOTMENTS
Gary S. Kalagian, Robert P. Eckert, and William A. Daniel Mar. 1984 122 p refs
(PB84-173848; FCC/OST/R-84-1-Pt-2) Avail: NTIS HC A06/MF A01 CSCL 17B

Estimates of how many additional UHF channels could be made available if channel assignment limitations having to do with the receiver intermediate frequency (I.F.) were eliminated are given. An advanced technology receiver with characteristics that would make feasible the elimination of these restrictions was constructed. The estimates providing additional channel availability are obtained by examining the detailed situation in every area of the country with the aid of a recently developed computer program. The computer program provides expanded tables of UHF-TV channel allotments as samples of the possibilities. These tables are hypothetical. GRA

N84-25922# New Hampshire Univ., Durham.
DIGITAL ANALYSIS OF PULSE CODE MODULATED SIGNALS IN TELECOMMUNICATIONS CHANNELS Ph.D. Thesis
Edmund Littlefield Chase 1983 288 p
Avail: Univ. Microfilms Order No. DA8403935

In this dissertation the techniques required to test pulse code modulated telecommunications channels are developed using the fast Fourier transform. The techniques are then applied through the design and assembly of the corresponding hardware. Windowing of data to improve spectral estimation is discussed as well as the conditions where special test signals may be synthesized to preclude the need for windowing. Conjugate periodic functions encountered in prime radix transforms are defined and their fast transform techniques are developed. Dissert. Abstr.

N84-26262*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DIGITALLY CONTROLLED SONARS
G. R. Hansen *In* Naval Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 157-171 (For primary document see N84-26257 16-48)
(Contract NAS7-100)
(AD-P003121) Avail: NTIS HC A13/MF A01 CSCL 17/1

N84-26445 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
TRANSPONDER OPTIMIZATION BY COMPUTER SIMULATION
Ottfried Baetz and Claus Peter Fischer *In its* Tech. and Sci. Publ. 1983 1983 p 259-260 refs In GERMAN; ENGLISH summary (For primary document see N84-26430 16-81)
(MBB-UR-617-83-O) Avail: Issuing Activity

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-25923 Royal Signals and Radar Establishment, Malvern (England).
A REASSESSMENT OF THE MEASUREMENT UNCERTAINTY OF THE XT-90 TWIN T DUAL ADMITTANCE BRIDGE
G. J. Slack and T. N. W. Graham 1983 34 p refs
(AD-A139253; RSRE-Memo-3632; BR90881) Copyright. Avail: Issuing Activity

The RSRE XT-90 Twin T Dual Admittance Bridge, commonly called the Woods bridge after its designer, operates over the frequency range from 5 to 200 MHz and is capable of measuring each component of an unknown admittance, within the range to 50 pF and/or 0 to 50 mS. Both the developments carried out and the measurement methods used on the bridge in order to produce a reassessment of the bridge measurement uncertainty are described. A simple explanation of the bridge circuit design is included. Author

N84-25924# Materials Research Labs., Melbourne (Australia). Physical Chemistry Div.
PERFORMANCE RESULTS OF A SMALL-CALIBRE ELECTRO-MAGNETIC LAUNCHER
G. A. Clark and A. J. Bedford Feb. 1984 37 p refs
(MRL-R-917; AR-003-898) Avail: NTIS HC A03/MF A01

Results of electromagnetic launcher experiments are presented. Using an inductor and a crowbarred capacitor bank, 0.3 g projectiles were accelerated over 800 mm to a velocity of 3.3 km/s. Voltage, current, power and energy curves, tables of muzzle volts and efficiencies are presented. The launcher design, circuit parameters and instrumentation are detailed. The data may be used by others to test theoretical work and to compare with experiments on other systems. E.A.K.

N84-25925# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
LOW NOISE AMPLIFIER AT L BAND [AMPLIFICADOR DE BAIXO RUIDO EM BANDA L]
Eduardo Antonio Parada Tude May 1984 10 p refs In PORTUGUESE; ENGLISH summary Presented at the 1st Simposio Brasileiro de Microondas, Sao Paulo (Brazil), 23-25 Jul. 1984
(INPE-3128-PRE/519) Avail: NTIS HC A02/MF A01

The design of a low noise amplifier ($T < 80$ K) at 1700 MHz, to be used in the front end of the WEFAX converter is described. The gain is 40 dB and the rejection of 1420 MHz is 23 dB. E.A.K.

N84-25926*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOW-FREQUENCY SWITCHING VOLTAGE REGULATORS FOR TERRESTRIAL PHOTOVOLTAIC SYSTEMS
Richard DeLombard May 1984 27 p refs
(Contract DE-AI01-79ET-20485)
(NASA-TM-83625; E-2060; DOE/NASA/20485-16; NAS 1.15:83625) Avail: NTIS HC A03/MF A01 CSCL 09A

The photovoltaic technology project and the stand alone applications project are discussed. Two types of low frequency switching type regulators were investigated. The design, operating characteristics and field application of these regulators is described. The regulators are small in size, low in cost, very low in power dissipation, reliable and allow considerable flexibility in system design. E.A.K.

N84-25927*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EDGE ANALYZING PROPERTIES OF CENTER/SURROUND RESPONSE FUNCTIONS IN CYBERNETIC VISION
Daniel J. Jobson May 1984 34 p refs
(NASA-TM-85809; NAS 1.15:85809) Avail: NTIS HC A03/MF A01 CSCL 20F

The ability of center/surround response functions to make explicit high resolution spatial information in optical images was investigated by performing convolutions of two dimensional response functions and image intensity functions (mainly edges). The center/surround function was found to have the unique property of separating edge contrast from shape variations and of providing a direct basis for determining contrast and subsequently shape of edges in images. Computationally simple measures of contrast and shape were constructed for potential use in cybernetic vision systems. For one class of response functions these measures were found to be reasonably resilient for a range of scan direction and displacements of the response functions relative to shaped edges. A pathological range of scan directions was also defined and methods for detecting and handling these cases were developed. The relationship of these results to biological vision is discussed speculatively. Author

N84-25928# Selenia S.p.A., Rome (Italy).
SAR TRANSMITTER Final Report
Paris ESA 23 Jun. 1983 144 p refs
(Contract ESA-4122/79/NL-PP)
(SES/ENG/TN-254/83; ESA-CR(P)-1848) Avail: NTIS HC A07/MF A01

In the follow-on of the ESA contract 4122/79 it was intended to demonstrate on breadboard the feasibility of a modular EPC supplied by a multibus for a KLYSTRON power transmitter. The aim of this final report is to give details on the design and on test results of the electronics required to drive a KLYSTRON for a SAR system. The concept utilized for the DC/DC conversion is a Series Resonant type (SCHWARZ Converter). An elegant Breadboard of 2 Modules (over 4 required for the complete EPC) has been realized and the tests have demonstrated the envisaged feasibility of an active redundancy with modular EPC both for output voltage generation and for output power. Also the concept of the multibus has been implemented (2 bus over 4) and verified in the EPC breadboard. B.W.

N84-25929# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrkonstruktionen.
ADAPTIVE CORRECTION OF CONTROL MACHINES Final Report [ADAPTIVE PRUEFMASCHINENKORREKTUR]
John H. Argyris, Werner Aicher, and Juergen Ertelt Apr. 1983 78 p refs In GERMAN
(Contracts DFG-Ar-44/43; DFG-Ar-44/53)
(ISD-301; ISSN-0170-6071) Avail: NTIS HC A05/MF A01

A data reduction method which is under adaptive correction of an error control value of the analog control system of a servohydraulic control machine was examined. For the use of the analog control no special care is needed. The composition of the correction matrix follows so fast that the test results are unrelated to it, as if the matrix was empty at the beginning of the test or as if, at a previous identical test a ready build correction matrix was applied. The program of ideal value generation and adaptive correction was loaded from a central data processor into a microprocessor which is assigned to a control machine and from there on the method is independent from the principal system. Transl. by E.A.K

N84-25930# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
DERATING REQUIREMENTS AND APPLICATION RULES FOR ELECTRONIC COMPONENTS
Dec. 1982 29 p
(ESA-PSS-01-301-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The minimum derating requirements and application rules for electronic, electrical, and electromechanical components used in flight standard equipment are defined. Parameter degradations to be considered in performing worst case analyses are given. E.A.K.

N84-25931# European Space Research and Technology Center, Noordwijk (Netherlands). Products Assurance Div.
GENERIC SPECIFICATION FOR HYBRID MICROCIRCUITS
Jul. 1983 56 p
(ESA-PSS-01-608-Issue-1; ISSN-0379-4059) Avail: NTIS HC A04/MF A01

The general requirements for circuit type approval, procurement, lot acceptance testing and delivery of thick and thin film hybrid microcircuits suitable for space application are defined. It is used in conjunction with the detail specification applicable to the actual circuit type. E.A.K.

N84-25932# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
UNIPOLAR ELECTRIC MACHINES WITH LIQUID-METAL CURRENT PICKUP
A. I. Bertinov, B. L. Aliyevskiy, and S. R. Troitsky 8 Mar. 1984 525 p Transl. into ENGLISH of mono. "Unipolyarnyye Elektricheskiye Mashiny s Zhidkometallicheskim Tokos'yemom" Moscow-Leningrad, Energiya, 1966 p 1-311
(AD-A139778; FTD-ID(RS)T-1205-83) Avail: NTIS HC A22/MF A01 CSCL 09/3

The theory of acyclic machines with liquid-metal contacts is discussed. The classification of acyclic machines, their electromagnetic fields, and computations relative to leakage fluxes and armature reactions are discussed. R.J.F.

N84-25933# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
INSTALLATION AND EVALUATION OF SPLICE M.S. Thesis
K. A. Lewis 1984 72 p
(AD-A140170; AFIT/CI/NR-84-5T) Avail: NTIS HC A04/MF A01 CSCL 09/5

The project consisted of two parts. The mixed-mode circuit simulation program SPLICE was to be modified and installed on the IBM 4341. Then test circuits were to be simulated to evaluate SPLICE as a simulator. The installation on the IBM consisted of modification of FORTRAN source code and system functions from the VAX/VMS to the IBM. Separate circuits were simulated to illustrate SPLICE's analysis of logical, electrical, and mixed-mode circuits. SPLICE is not a general purpose circuit simulation program. The available analog elements are limited. SPLICE is of limited use for simulation of LSI-type circuits consisting of logical gates connected by MOSFET switching circuitry. Author (GRA)

N84-25934# Westinghouse Electric Corp., Annapolis, Md.
ADVANCED MOTOR-CONTROLLER DEVELOPMENT Final Report, Oct. 1979 - Jun. 1983
L. E. Lesster, D. B. Zeitlin, and W. B. Hall 22 Jun. 1983 378 p
(Contract N00167-82-C-0122)
(AD-A140299; DTNSRDC-PASD-CR-1-83) Avail: NTIS HC A17/MF A01 CSCL 09/3

The purpose of this development program was to investigate a promising alternative technique for control of a squirrel cage

induction motor for subsea propulsion or hydraulic power applications. The technique uses microprocessor based generation of the pulse width modulation waveforms, which in turn permits use of a true integral volt-second pulse width control for the generation of low harmonic content sine waves from a 3 phase Graetz transistor power bridge. GRA

N84-25935# Royal Signals and Radar Establishment, Malvern (England).
INTERMEDIATE ACCESS SWITCH: A MULTIPROCESSOR APPLICATION
T. G. Connelly and M. P. Griffiths Sep. 1983 72 p
(AD-A140363; RSRE-83004; BR91262) Avail: NTIS HC A04/MF A01 CSCL 09/1

Design options for the implementation of the control software for a computer controlled, circuit switching exchange (Intermediate Access Switch or IAS) on a multiprocessor system (DISCUS) are outlined. The impact of DISCUS and its operating system on software structure and software development, integration, and testing methods is discussed, and a set of guidelines for the division of a complete software package among several co-operating processors is drawn up. The advantages and penalties of the multi-processor approach, as compared with the single processor approach, are pointed out, and a quantitative assessment of system performance based on the use of a traffic generator is presented. Author (GRA)

N84-25936# Ohio State Univ., Columbus. Electroscience Lab.
JOINT SERVICES ELECTRONICS PROGRAM Annual Report, Nov. 1982 - Nov. 1983
Dec. 1983 211 p
(Contract N00014-78-C-0049)
(AD-A140434; ESL-710816-15; AR-6) Avail: NTIS HC A10/MF A01 CSCL 09/5

This report presents the sixth annual summary of research at Ohio State sponsored by the Joint Services Electronics Program (JSEP). The research is in the area of electromagnetics and the specific topics are: (1) Diffraction Studies; (2) Hybrid Techniques; (3) Integral Equation Studies; (4) Time Domain; and (5) Transient Signature Measurements of Radar Targets for Inverse Scattering Research. Author (GRA)

N84-25937# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
THE CRIMPING OF HIGH-RELIABILITY ELECTRICAL CONNECTIONS
Dec. 1982 38 p
(ESA-PSS-01-726-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

This specification defines ESA requirements and quality assurance provisions for crimping wire terminations intended for high-reliability electrical connections. These terminations include removable contacts, coaxial connectors and ferrules which are crimped to wire conductors and other electrical or electronic components for use on ESA spacecraft and associated equipment operating under high vacuum, thermal cycling and vibration.Author

N84-26199# Aerospace Corp., Los Angeles, Calif. Space Sciences Lab.
LABORATORY AND SPACE MEASUREMENTS OF MATERIALS
J. F. Fennell, P. F. Mizera, and M. S. Leung *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 197-213 refs (For primary document see N84-26185 16-46)
(Contract F04701-82-C-0083)
(AD-P002113) Avail: NTIS HC A18/MF A01 CSCL 09/1

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-25938 Case Western Reserve Univ., Cleveland, Ohio.
EXPERIMENTAL INVESTIGATION OF TWO-DIMENSIONAL SHOCK BOUNDARY LAYER INTERACTIONS Ph.D. Thesis
Stanley Andrew Skebe 1983 786 p
Avail: Univ. Microfilms Order No. DA8405256

Experiments were performed on the interaction of oblique shock waves with flat plate boundary layers in the forward test section of the 30.48 cm. x 30.48 cm. (1 ft. x 1 ft.) Supersonic Wind Tunnel at the NASA-Lewis Research Center. Measurements of the plate surface static pressure and shear stress distributions as well as boundary layer velocity profiles were obtained through the interaction region. Flow conditions for these investigations encompassed a Mach number set from 2.0 to 4.0 and an overall unit Reynolds number range of 4.72E6 to 2.95E7 /m. The findings presented herein provide a complete description of two-dimensional interactions with initially laminar boundary layers over the Mach number range 2.0 to 4.0. Additional information with regard to interactions involving initially transitional boundary layers is provided over the Mach number range 2.0 to 3.0 and those for initially turbulent boundary layers at Mach 2.0. The experiments were motivated with achievement of benchmark results as their primary goal, in order to yield detailed information of high accuracy for service as a test case of analytic and numeric schemes of the present and future. Dissert. Abstr.

N84-25939 Bundesministerium des Innern, Bonn (West Germany).
HEAT TRANSFER COEFFICIENT IN CONTAINMENTS (HTCC): A HEAT TRANSFER MODEL FOR GAS-VAPOR MIXTURES Final Report, Jul. 1983 [HTCC: EIN WAERMEUEBERGANGSMODELL FUER GAS-DAMPF-GEMISCHE]
P. Papadimitriou (Gesellschaft fuer Reaktorischerheit mbH) Dec. 1983 105 p refs In GERMAN
(Contract BMI-SR-271)
(BMI-1983-022; GRS-A-849; ISSN-0724-3316) Copyright. Avail: Issuing Activity

The heat transfer coefficient in containment (HTCC) model, to investigate the heat transfer coefficients between containment atmospheres and reactor walls after a cooling system failure, was developed. The HTCC is implemented in the RALOC program. Calculated temperature variations, in the HEOL standard problem of hydrogen distribution and temperature distribution during the heating period, show good agreement with the experimental data. Transl. by E.A.K.

N84-25940# Ballistic Research Labs., Aberdeen Proving Ground, Md.
TREATMENT OF THE DISCONTINUITY IN THE SPIN-UP PROBLEM WITH IMPULSIVE START Final Report
Raymond Sedney and Nathan Gerber Sep. 1983 33 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A133682; ARBRL-TR-02520) Avail: NTIS HC A03/MF A01 CSCL 20/4

The spin-up equation derived from the Wedemeyer model is considered. For an impulsive start, the boundary conditions prescribe a discontinuity in the velocity on the boundary. The finite difference solution of the spin-up equation is significantly in error unless the discontinuity is treated properly. A solution in the neighborhood of the discontinuity is derived by a direct coordinate expansion, after a stretching transformation is applied. This solution is used as an approximate initial condition; the approximation is evaluated and tests show that the error is negligible. The details are given for laminar Ekman layers; just the results are given for the turbulent case. Author

N84-25941*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mechanical and Aerospace Engineering.
SCALING AND MODELING OF THREE-DIMENSIONAL, END-WALL, TURBULENT BOUNDARY LAYERS Ph.D. Thesis - Final Report
Uriel C. Goldberg and Eli Reshotko Washington NASA Jun. 1984 135 p refs
(Grant NAG3-270)
(NASA-CR-3792; E-2024; NAS 1.26:3792) Avail: NTIS HC A07/MF A01 CSCL 20D

The method of matched asymptotic expansion was employed to identify the various subregions in three dimensional, turbomachinery end wall turbulent boundary layers, and to determine the proper scaling of these regions. The two parts of the b.l. investigated are the 3D pressure driven part over the endwall, and the 3D part located at the blade/end wall juncture. Models are proposed for the 3d law of the wall and law of the wake. These models and the data of van den Berg and Elsenaar and of Mueller are compared and show good agreement between models and experiments. E.A.K.

N84-25942# Materials Research Labs., Melbourne (Australia). Physical Chemistry Div.
SHOCK WAVE MODELLING AND THE HULL COMPUTER CODE FORMATION OF MACH STEMS
J. A. Waschl Nov. 1983 29 p refs
(MRL-R-907; AR-003-803) Avail: NTIS HC A03/MF A01

The HULL code was modified to run on an Australian computer system (CSIRO Cyber 7600) to examine its capabilities. The HULL was used to simulate the collision of a travelling shock wave with an oblique ramp set up within a shock tube. The resultant Mach Stem formation and growth and the Triple Point trajectory were analyzed and their validity verified using the Rankine-Hugoniot relationships across the shock front and the Whitham theory on shock wave diffraction at concave corners. E.A.K.

N84-25943*# Cleveland State Univ., Ohio. Dept. of Mechanical Engineering.
EFFECTS OF UNSTEADY FREE STREAM VELOCITY AND FREE STREAM TURBULENCE ON STAGNATION POINT HEAT TRANSFER Final Report
Rama S. R. Gorla Washington NASA Jun. 1984 39 p refs
(Contract NCC3-3)
(NASA-CR-3804; E-2100; NAS 1.26:3804) Avail: NTIS HC A03/MF A01 CSCL 20D

The combined effects of transient free stream velocity and free stream turbulence on heat transfer at a stagnation point over a cylinder situated in a crossflow are studied. An eddy diffusivity model was formulated and the governing momentum and energy equations are integrated by means of the steepest descent method. The numerical results for the wall shear stress and heat transfer rate are correlated by a turbulence parameter. The wall friction and heat transfer rate increase with increasing free stream turbulence intensity. Author

N84-25944*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DRAG OF TWO-DIMENSIONAL SMALL-AMPLITUDE SYMMETRIC AND ASYMMETRIC WAVY WALLS IN TURBULENT BOUNDARY LAYERS
John C. Lin, Michael J. Walsh, and R. Balasubramanian (Cambridge Hydrodynamics, Inc., Lexington, Mass.) Jun. 1984 165 p refs
(NASA-TP-2318; L-15761; NAS 1.60:2318) Avail: NTIS HC A08/MF A01 CSCL 20D

Included are results of an experimental investigation of low-speed turbulent flow over multiple two-dimensional transverse rigid wavy surfaces having a wavelength on the order of the boundary-layer thickness. Data include surface pressure and total drag measurements on symmetric and asymmetric wall waves under a low-speed turbulent boundary-layer flow. Several asymmetric wave configurations exhibited drag levels below the equivalent symmetric (sine) wave. The experimental results compare favorably with numerical predictions from a Reynolds-averaged Navier-Stokes spectral code. The reported results are of particular interest for the estimation of drag, the minimization of fabrication waviness effects, and the study of wind-wave interactions. Author

N84-25945# Cranfield Inst. of Tech., Bedfordshire (England). School of Mechanical Engineering.
TURBULENT PRANDTL NUMBER DISTRIBUTION WITHIN THE CONSTANT STRESS/HEAT-FLUX REGION OF A NEAR-WALL FLOW
G. P. Hammond Jan. 1984 19 p refs
(SME-8401) Avail: NTIS HC A02/MF A01

The turbulent Prandtl number variation within the near-wall region of fully-developed boundary layers is obtained by using profile analysis. This is achieved by deriving expressions for the eddy diffusivities from Spalding's inner layer formula and its thermal analogue. The analysis is performed over two orders of magnitude of the molecular Prandtl number, encompassing most of the common, non-metallic fluids. It ensures that the limiting conditions at high and low turbulence Reynolds numbers are satisfied explicitly. The turbulent Prandtl number distribution is found to be complex, and dependent on its molecular counterpart within the diffusive sublayer. It is compared with the distributions implied by several phenomenological models, and the consequences for the treatment of the near-wall region in numerical calculation procedures for thin shear layers are discussed. Author

N84-25946*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A SEMI-DIRECT PROCEDURE USING A LOCAL RELAXATION FACTOR AND ITS APPLICATION TO AN INTERNAL FLOW PROBLEM
Sin-Chung Chang 1984 9 p refs Presented at the 9th Intern. Conf. on Numerical Methods in Fluid Dyn., Saclay, France, 25-29 Jun. 1984; sponsored by CEA, CISI, DRET, CNES, EDF, Framatome and Novatome
(NASA-TM-83704; E-2162; NAS 1.15:83704) Avail: NTIS HC A02/MF A01 CSCL 20D

Generally, fast direct solvers are not directly applicable to a nonseparable elliptic partial differential equation. This limitation, however, is circumvented by a semi-direct procedure, i.e., an iterative procedure using fast direct solvers. An efficient semi-direct procedure which is easy to implement and applicable to a variety of boundary conditions is presented. The current procedure also possesses other highly desirable properties, i.e.: (1) the convergence rate does not decrease with an increase of grid cell aspect ratio, and (2) the convergence rate is estimated using the coefficients of the partial differential equation being solved. Author

N84-25947*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CANONICAL SOLUTIONS FOR UNSTEADY FLOW FIELDS M.S. Thesis - George Washington Univ.
Grace C. Liu May 1984 73 p refs
(NASA-TM-85812; NAS 1.15:85812) Avail: NTIS HC A04/MF A01 CSCL 20D

The initial value problem of one-dimensional gas-dynamics involving discontinuous, nonuniform initial data is discussed. Canonical solutions which are valid in a small x, t region aroung a discontinuity, and which include the first order effects of nonuniformities in the data, are derived explicitly. The theory is derived by considering a group of elementary piston problems. Solutions with a shock or with a centered expansion wave are worked out individually in order to relate initial flow properties and their gradients to the speed and acceleration of the discontinuity waves. They are then combined to represent the solution of a general initial value problem by regarding the piston path as a contact line. In addition, problems with chemical reaction are discussed in terms of elementary piston problems which involve strong detonation waves, Chapman-Jouguet detonation waves, and deflagration waves. M.G.

N84-25948# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abt. Elastomechanik und Aeroelastische Stabilitaet.

A PROBE FOR DIRECT MEASUREMENTS OF FLOW DIRECTION

Raymond Freymann Nov. 1983 31 p refs In GERMAN; ENGLISH summary Also announced as translation (ESA-TT-853)

(DFVLR-FB-83-27; ESA-TT-853) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 13,50

The design of a two-hole incidence-angle probe with integrated miniature pressure pickups to determine flow direction is described. The test procedures used for calibration of the probe is discussed in detail. Experimentally determined results from frequency response tests suggest that this probe is best suited for determination of the flow direction of unsteady airflow. Author

N84-25949# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

SPLITTING OF CONDENSATION SHOCK WAVES IN FLUIDS OF HIGH SPECIFIC HEAT

Hans Dieter Speckmann 1984 90 p refs In GERMAN; ENGLISH summary

(MPIS-Mitt-76; ISSN-0374-1257) Avail: NTIS HC A05/MF A01

The splitting of condensation shock waves in gases with high specific heat is proven experimentally. These gases are partially liquified by adiabatic compression in a shock wave. Such a wave separates two physical conditions of a substance. In this case the upstream state is gaseous, the downstream state is a mixture of liquid and gas. In the case of gases with high specific heat the shock adiabat shows a discontinuity of its slope at the boundary to the two phase region. The adiabat is convex at this point. If this discontinuity is between the initial and the end state of an adiabatic compression, then it causes a splitting of the condensation shock wave in two distinct waves of differing wave speed. The changes of thermodynamic properties of the substance behind each shock wave are calculated using suitable equations of state and the results are compared with the measured quantities.

Author

N84-25950# Centro Informazioni Studi Esperienze, Milan (Italy). Servizio Documentazione.

HEAP PUMPS MARKETING PROBLEMS AND THE ROLE PLAYED BY THE FINANCIAL INCENTIVES PROVIDED BY THE LAW 308/82 [PROBLEMATICHE DI MERCATO DELE POMPE DI CALORE E RUOLO DEGLI INCENTIVI FINANZIARI PREVISTI AI SENSI DELLA LEGGE 308/82]

E. Dallavalle and E. Piantoni 1983 58 p In ITALIAN Presented at the Workshop on Heat Pump Center, Milan, 1 Dec. 1983

(CISE-2149) Avail: NTIS HC A04/MF A01

The principle techno-economic factors which influence the utilization of heat pumps are examined. Through the analysis of current technology and the economic incentives expected from articles 6-7, 8-9, and 12 of law 308/82, some results are derived which give some indication of the future of the market.

Transl. by M.G.

N84-25951# Delft Hydraulics Lab. (Netherlands).

PRACTICE; CRITERIA; PROVISIONS; MATHEMATICAL DESCRIPTIONS: EXAMPLES

J. Wijdieks Jun. 1983 49 p refs

(Publ-310) Avail: NTIS HC A03/MF A01

Waterhammer is defined as the appearance of pressure changes in closed conduits caused by velocity changes with time of the flow. Therefore waterhammer may occur in all kinds of pipelines in which flow changes occur over time: long or short pipelines for oil, sewage, drinking water, cooling water, slurry, coal slurry, chemicals, and in fresh water or city heating networks. The phenomenon of waterhammer is discussed herein. Specific parameters addressed include: the practical causes of waterhammer, cavitation flow, overpressure, vapor pressures, bulk modulus, continuous and discontinuous flow, and provisions to prevent waterhammer. Calculation of waterhammer is presented along with a mathematical description thereof. Hydraulic equipment (valves, pumps, surge towers) is also discussed. R.S.F.

N84-25952# Oxford Univ. (England). Wind Engineering Research Group.

A REVIEW OF THE BASIC CONCEPTS OF DENSE GAS DISPERSION WITH SPECIAL REGARD TO MODELLING OF HEAT TRANSFER

M. N. Tasker Jan. 1984 50 p refs

(QUEL-1512/84) Avail: NTIS HC A03/MF A01

Dense gas dispersion is the study of the spreading and dilution of a gas that has a density greater than that of ambient air. Models to predict the dispersion of such dense gases as chlorine, sulfur dioxide, liquefied natural gas, and liquid propane are necessary to prevent a catastrophe in environmental and/or human terms. A basic physical picture of dense gas dispersion is provided. Mathematical and wind tunnel models of dense gas flow are presented and discussed, including the constraints and disadvantages of modelling techniques. Special emphasis is given to heat transfer during dense gas dispersion. R.S.F.

N84-25953# European Space Agency, Paris (France).

MEASUREMENT OF THE FLOW FIELD BEHIND HARMONICALLY OSCILLATING GUST GENERATORS IN THE MODEL SUBSONIC WIND TUNNEL (MUK)

Bernd Krag Sep. 1983 141 p refs Transl. into ENGLISH of "Vermessung des Boeenfeldes hinter harmonisch schwingenden Boeenerzeugern im Modell-Unterschall-Kanal (MUK)" rept. DFVLR-FB-82-26 DFVLR, Brunswick, Aug. 1982 Original language document announced as N83-20920

(ESA-TT-806; DFVLR-FB-82-26) Avail: NTIS HC A07/MF A01; original German report available from DFVLR, Cologne DM 46,20

The installation of a gust generator is under consideration for the German-Netherland wind tunnel (DNW). Basic investigations in the model subsonic wind tunnel of the DFVLR Brunswick are designed to show which parameters influence the propagation of the gust field and which type of gust generator will be best suited for the DNW. Four different types of gust generators were investigated. The gust field was measured within the complete volume of the test-section using dynamic flow direction probes. This report presents the results of the investigations in the MUK.

Author

N84-25954# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

RESONANT COHERENT ANTI-STOKES RAMAN SCATTERING Ph.D. Thesis - Paris-Univ. Sud

Brigitte Attal 1983 145 p refs In FRENCH; ENGLISH summary Report will also be announced as ESA-TT-876

(ONERA-P-1983-3; ISSN-0078-379X; ESA-TT-876) Avail: NTIS HC A07/MF A01

The advantages of resonant excitation are pointed out after a brief review of the main CARS properties and of the work done in the past few years. In this case, the lines observed in coherent Raman scattering are resonantly enhanced; detectability is thus improved and the detection of trace components in gas mixture becomes possible. By investigating the expression of the third order susceptibility, the main contributions were identified and classified. If the laser frequencies are tuned to the proper spectral domain, several denominators of these terms become simultaneously resonant. Thus double or triple resonances are obtained, depending on the particular case of the C2 radical. The performance of the CARS spectrometer was improved. Electronic enhancement was achieved by tuning the laser frequencies to the Swan system. Author

N84-25955# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

PSEUDO-UNSTEADY SYSTEMS FOR STEADY INVISCID FLOWS

Henri Viviand 1983 57 p refs In FRENCH; ENGLISH summary Report will also be announced as ESA-TT-877

(ONERA-P-1983-4; ISSN-0078-379X; ESA-TT-877) Avail: NTIS

HC A04/MF A01

The first order partial differential equations of pseudo-unsteady type for the calculation of steady inviscid flows, either compressible and iso-energetic, or incompressible were studied. A family of such systems depending on 5 parameters is considered. The condition for a system to be hyperbolic with respect to time, as well as a condition relating to the number of eigenvalues of same given sign, are discussed in detail as a function of these parameters. Several examples of pseudo-unsteady systems are given, showing up the very varied properties which these systems possess. In particular there exists systems which are optimal with regard to an explicit numerical stability criterion. In the case of flows which, moreover, either are homentropic for a compressible fluid, or have uniform total pressure for an incompressible fluid, a 2 parameter family of simpler pseudo-unsteady systems is shown to exist. The properties of these systems are also discussed, and several examples are given. Author

N84-25956# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
A FINITE DIFFERENCE METHOD FOR INVERSE MODE CALCULATIONS OF A THREE-DIMENSIONAL BOUNDARY LAYER Ph.D. Thesis - Paris Univ. 6
Martin Formery 1982 77 p refs In FRENCH; ENGLISH summary
Report will also be announced as ESA-TT-863
(AD-B071559; ONERA-NT-1982-6; ISSN-0078-3781; ESA-TT-863) Avail: NTIS HC A05/MF A01

A numerical method is proposed to solve the turbulent 3-D boundary layer equations by inverse approaches where either the longitudinal and transverse displacement thicknesses or the wall shear stress components are prescribed. The method was programmed for the case of a boundary layer developing on a flat wall, considering both incompressible and compressible flows. Simple turbulent models (algebraic and 2 transport equation models) were used. The equations are solved by using a strongly implicit finite difference method. The applications, made in subsonic and transonic flows, show that a separation is crossed without any numerical difficulty, and that it is possible to extend the calculation of the boundary layer in the separated zone and beyond the reattachment line. The results obtained are in good agreement with available experimental data; in particular, the flow structure in the vicinity of the separation line is faithfully represented. Author

N84-25957# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
THE COMPUTATION OF INVISCID-VISCOUS COUPLED EQUATIONS BY A FINITE ELEMENT METHOD Ph.D. Thesis - Paris Univ. 6
Odile Labbe 1983 66 p refs In FRENCH; ENGLISH summary
Report will also be announced as ESA-TT-866
(ONERA-NT-1983-1; ISSN-0078-3781; ESA-TT-866) Avail: NTIS HC A04/MF A01

The Navier-Stokes equations were computed numerically for two dimensional steady incompressible flow. The calculation domain is divided into two areas, one where the fluid is considered viscous and the other where it is considered inviscid. A method using a finite flow and vortex element is used to solve the equation - delta psi=omega throughout the domain of inviscid flow with omega kept at zero, and to solve the vortex diffusion convection equation in the viscous area. The vortex error was estimated by replacing the full problem by the coupled problem. The algorithm which uses a conjugate gradient method to solve the diffusion convection equation is described. The numerical data for a symmetrical NACA 0012 profile is given. Different calculations are compared by moving the coupling boundary for a Reynolds number of 400. Author

N84-25958# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CONTRIBUTION TO THE STUDY OF A NUMERICAL IMPLICIT METHOD FOR SOLVING THE EULER EQUATIONS Ph.D. Thesis - Paris Univ. 6
Virginie Daru 1983 113 p refs Report will also be announced as translation
(ONERA-NT-1983-8; ISSN-0078-379X) Avail: NTIS HC A06/MF A01

A class of numerical implicit schemes, which was introduced by A. Lerat, to solve hyperbolic systems of conservation laws is studied. These schemes are applied to the calculation of flows around wing profiles using the Euler equations. A linear stability analysis of these schemes taking the boundary conditions into account is then presented; it is based on the theory of Gustafsson, Kreiss and Sundstrom. The theoretical results are confirmed by numerical experiments and show the importance of the choice of the boundary conditions on the stability of the global approximation. Finally, it is shown that the rate of convergence of the implicit method to reach a steady solution is directly connected with the behavior of the amplification factor of the scheme when the time step is large. The numerical experiments show the efficiency of the scheme in the one dimensional case. Another way to extend the scheme to the case of two space variables is also presented. M.G.

N84-25959# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NUMERICAL PREDICTION OF MULTIREACTIVE TURBULENT FLOWS BY A EULERIAN-LAGRANGIAN METHOD Ph.D. Thesis - Poitiers Univ.
Edith Pourbaix 1983 48 p refs in FRENCH; ENGLISH summary
Translation will also be announced as ESA-TT-881
(ONERA-NT-1983-9; ISSN-0078-3781; ESA-TT-881) Avail: NTIS HC A03/MF A01

In most practical cases of flows in turbomachine combustion chambers, many chemical reactions take place, involving several reactive species; the probability density function (p.d.f.) of mass fractions and temperature then depends on several random variables. The Eulerian balance equation for the p.d.f. is then very complicated and it is often impossible to solve it numerically. However, using both classical Eulerian balance equations for mean-values and standard deviation, and Lagrangian models, allows to find a quite realistic approximation of the p.d.f. projection in the phase space (mass fractions and temperature). This projection consists of just a few curves, even in the case of a multidimensional p.d.f. a simple integration along these curves then provides the different mean values of the flow field. For example using this method for a premixed air-methane flame allows one to compute all the mean characteristic values, at each point of the flame, particularly the mass fractions of methane and CO, and the temperature. Author

N84-25960# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
UNSTEADY FLOW IN TURBOMACHINES, VOLUME 1
1984 323 p refs Lecture Ser. held at Rhode-Saint-Genese, Belgium, 20 - 24 Feb. 1984 2 Vol.
(VKI-LS-1984-02-Vol-1) Avail: NTIS HC A14/MF A01

Unsteady flow is an essential aspect of the energy exchange between the fluid and blade rows in a turbomachine. This lecture series concentrated mainly on the rotating stall by discussing the prediction methods for single and multistage compressors, analyzing new experimental evidence on cell patterns and cell structure and proposing methods for the determination of the stall line in industrial and aeromachine compressors. A review of numerical methods for the handling of unsteady flows and the experience of manufacturers and research organizations with engine stall completed the lecture series. For individual titles, see N84-25961 through N84-25964.

N84-25961*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
UNSTEADY FLOW IN TURBOMACHINERY: AN OVERVIEW
In Von Karman Inst. for Fluid Dynamics Unsteady Flow in Turbomachines, Vol. 1 1984 p 1-20 refs (For primary document see N84-25960 16-34)
Avail: NTIS HC A14/MF A01

The importance of understanding and modeling the unsteady flow phenomena in turbomachinery is discussed. Historical events in the application and development of gas turbines for aircraft propulsion are traced. Technology advancements over the years are highlighted with focus on the compression system components. Trends in compressor research within the National Advisory Committee for Aeronautics (NACA)/National Aeronautics and Space Administration (NASA) are noted. The impact of technology advancements on the increased occurrences of unsteady flow related problems in advanced engine development programs is discussed. The impact of the new and more demanding requirements being imposed on the propulsion system to meet advanced aircraft mission needs are also noted. Brief discussions on the present day understanding and modeling capability of the unsteady flow phenomena are presented to include discussions on rotating stall, surge, flutter, forced response and noise generation. Author

N84-25962# Massachusetts Inst. of Tech., Cambridge.
INTRODUCTION TO UNSTEADY FLOW IN TURBOMACHINES
Edward M. Greitzer *In* Von Karman Inst. for Fluid Dynamics Unsteady Flow in Turbomachines, Vol. 1 1984 62 p refs (For primary document see N84-25960 16-34)
Avail: NTIS HC A14/MF A01

In this lecture some of the fluid dynamic phenomena that are associated with unsteady flow in turbomachines will be examined. It will be seen that there are several different sources of this unsteadiness, and that which of these is most important will depend on which aspect of the overall performance of the turbomachine is being examined. This discussion is intended to be an introduction to the subject and to provide an appreciation for the basic fluid mechanic concepts, rather than to be an exhaustive review. The topics to be covered are: (1) the Inherent Unsteadiness of Turbomachinery Flows; (2) Sources of Flow Unsteadiness in Turbomachines; and (3) Introductory Discussion of Unsteady Viscous Flows. B.W.

N84-25963# Massachusetts Inst. of Tech., Cambridge.
STABILITY OF PUMPS AND COMPRESSORS
Edward M. Greitzer *In* Von Karman Inst. for Fluid Dynamics Unsteady Flow in Turbomachines, Vol. 1 1984 78 p refs (For primary document see N84-25960 16-34)
Avail: NTIS HC A14/MF A01

This lecture describes the types of flow instabilities that are encountered in dynamic compression and pumping systems. A detailed review is presented in which the different fluid mechanic phenomena associated with these instabilities, as well as the techniques that have been developed for predicting the onset of instability, are surveyed. This paper also contains elementary analyses that shows the phenomena associated with the instabilities, in several different systems of current engineering interest. The second part covers four topics. The first of these is an elementary analysis of rotating stall inception in axial compressors. The second is a description of a procedure for predicting the stalling pressure rise capability of axial flow compressor stages. The third is some additional material on the use of compressor casing and/or hub treatment (i.e. grooves) for stability enhancement. The final topic consists of a brief summary of a recent non-linear analysis of rotating stall in multistage compressors. B.W.

N84-25964# Cornell Univ., Ithaca, N.Y.
THEORY OF ROTATING STALL OF MULTISTAGE AXIAL COMPRESSORS
F. K. Moore *In* Von Karman Inst. for Fluid Dynamics Unsteady Flow in Turbomachines, Vol. 1 1984 112 p refs (For primary document see N84-25960 16-34)
Avail: NTIS HC A14/MF A01

An analysis is made of rotating stall in compressors of many stages, finding conditions under which a flow distortion can occur which is steady in a traveling reference frame, even though upstream total and downstream static pressure are constant. In the compressor, a pressure-rise hysteresis is assumed. Flow in entrance and exit ducts yield additional lags. These lags balance to give a formula for stall propagation speed. For small disturbances, it is required that the compressor characteristic be flat in the neighborhood of average flow coefficient. Results are compared with the experiments of Day and Cumpaty. If a compressor lag of about twice that due only to fluid inertia is used predicted propagation speeds agree almost exactly with experimental values, taking into account changes of number of stages, stagger angle, row spacing, and number of stall zones. The agreement obtained gives encouragement for the extension of the theory to account for large amplitudes. Author

N84-25965# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
UNSTEADY FLOW IN TURBOMACHINES, VOLUME 2
1984 353 p refs Lecture Ser. held at Rhode-Saint-Genese, Belgium, 20-24 Feb. 1984
(VKI-LS-1984-02-Vol-2; D/1984/0238/294-Vol-2) Avail: NTIS HC A16/MF A01

Various topics concerned with unsteady flow phenomena in turbomachinery are addressed. Particular attention is given to rotating stall, surges, and blade flutter in axial flow compressors. For individual titles, see N84-25966 through N84-25972.

N84-25966# Rolls-Royce Ltd., Derby (England).
ENCOUNTERS WITH SURGE
A. B. McKenzie *In* Von Karman Inst. for Fluid Dynamics Unsteady Flow in Turbomachinery, Vol. 2 1984 30 p (For primary document see N84-25965 16-34)
Avail: NTIS HC A16/MF A01

A review of the development of axial compressors for gas turbine engines is presented and the surge characteristics for each particular design are discussed. The Avon, Avon RA14, Conway, Tyne, Spey and RB 211 are addressed. Rotating stall, inlet maldistribution, and design parameters effecting surge occurrences are examined. M.G.

N84-25967# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
STRUCTURE OF ROTATING STALL CELLS. PART 1: ABSOLUTE MOTION
K. Mathioudakis and F. A. E. Breugelmans *In its* Unsteady Flow in Turbomachines, Vol. 2 1984 49 p refs (For primary document see N84-25965 16-34)
Avail: NTIS HC A16/MF A01

Measurement and data processing techniques developed in order to define rotating stall characteristics are presented. Application of these techniques to experiments on an axial flow compressor yielded several conclusions on the structure of the stalled flow field as it is seen from the stationary frame of reference. Two qualitatively different types of rotating stall have been identified: small stall and big stall. Small stall results in a gradual drop in the performance of the compressor. It is characterized by many cells of small amplitude fluctuations of velocity and angle. It is linked to separation on the blades, but the flow continues to move through the rotor without significant reorganization. Big stall causes an abrupt drop in the performance. The velocity and angle variations are very big and the flow field inside the cells is reorganized in a three dimensional manner with the appearance of reverse flow in front of the rotor. Comparison with results of other investigations showed the similarity of the flow field inside the big cells in all cases. M.G.

N84-25968*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NUMERICAL ASPECTS OF UNSTEADY FLOW CALCULATIONS
John J. Adamczyk *In* Von Karman Inst. for Fluid Dynamics Unsteady Flow in Turbomachines, Vol. 2 1984 75 p refs (For primary document see N84-25965 16-34)
Avail: NTIS HC A16/MF A01 CSCL 20D

The numerical aspects of simulation unsteady flows which arise in turbomachinery are addressed. In particular the simulation of rotating stall and surge is discussed. Author

N84-25969# Gremli Systemdynamik A.G., Abtwil (Switzerland).
SURGE PREDICTION IN INDUSTRIAL COMPRESSORS
Christian Gremli *In* Von Karman Inst. for Fluid Dynamics Unsteady Flow in Turbomachines, Vol. 2 1984 36 p refs (For primary document see N84-25965 16-34)
Avail: NTIS HC A16/MF A01

The stability limit of industrial compressors is strongly influenced by the dynamics of the surrounding process and the individual slopes of the stage characteristics. Most common stall criterions which are also used as surge criterions do not take this into account. In order to include the system dynamics and the individual slopes of the stage characteristics into the surge line prediction, the TOLDYM-method was developed. TOLDYM stands for Two Variable, One Dimensional, Linearized Dynamic Model. The real system is represented by a mathematical model. If the model is stable the real system is assumed to be stable too. Three simplifications (1-dimensional, linearized, constant temperature) are made in order to reduce model complexity. A set of model element types is available for the assembling of a model. The mathematical representation of the model elements and of the entire model are transfer matrices. The test of stability is performed by checking the real part of the eigenvalues of the transfer function. Three examples show that the results of this method are in agreement with measurements. M.G.

N84-25970# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
STRUCTURE OF ROTATING STALL CELLS. PART 2: RELATIVE MOTION
F. A. E. Breugelmans and K. Mathioudakis *In its* Unsteady Flow in Turbomachines, Vol. 2 1984 81 p refs (For primary document see N84-25965 16-34)
Avail: NTIS HC A16/MF A01

The velocity was measured near the blade surface at three different chordwise and two radial positions for all operating conditions of a low speed axial flow compressor. The local flow angle increases in the streamwise direction for a given operating condition on the negative slope part of the characteristic. This flow angle varies in the unstalled region from -7 deg, 18 deg to 60 deg. Important radial flow angles are observed during one and two cell rotating stall patterns. The 25% chord location experience a radially inward flow during rotating stall, while the 50% and 75% locations show radially outward flow. This radial motion decreases near the tip and mixes with the clearance flow. M.G.

N84-25971# Societe Nationale d'Etudes et de Construction de Moteurs d'Aviation, Moissy-Cramayel (France).
DETERMINATION OF THE STABLE OPERATING CONDITIONS OF AN AXIAL FLOW COMPRESSOR
B. Delahaye *In* Von Karman Inst. for Fluid Dynamics Unsteady Flow in Turbomachines, Vol. 2 1984 48 p refs (For primary document see N84-25965 16-34)
Avail: NTIS HC A16/MF A01

Unsteady flow phenomena in axial flow compressors are classified and some basic principles of measurement for each unsteady behavior are reviewed. Rotating stall, surge, blade flutter, stall margin, and distorted inlet flow are discussed. The prediction of stable operating conditions is also addressed with emphasis given to stall boundary prediction. Finally, methods for improving engine stability are reviewed. M.G.

N84-25972# Technische Hochschule, Aachen (West Germany). Inst. fuer Strahlantriebe und Turboarbeitsmaschinen.
UNSTEADY INTERACTIONS IN SUPERSONIC COMPRESSOR STAGES
K. D. Broichhausen and H. E. Gallus *In* Von Karmen Inst. for Fluid Dynamics Unsteady Flow in Turbomachines, Vol. 2 1984 32 p refs (For primary document see N84-25965 16-34)
Avail: NTIS HC A16/MF A01

The unsteady phenomena in the case of supersonic compressor flow are discussed on the basis of characteristic experimental results. The following conclusions can be drawn: the unsteady upstream disturbances caused by a supersonic rotor decrease hyperbolically and can be predicted by theoretic approaches for the relative flow; speeds generating slight supersonic relative inlet flow are critical for upstream interference; the downstream interference is caused by wakes and shockwaves; the unsteady pulsations in the stator increase with higher speeds; at high speeds the change of the flow angle is responsible for the unsteady effects; at lower speeds the influence of the velocity decay becomes more and more important; the unsteady fluctuations do not decrease continuously, but are intensified whenever shock oscillations are caused; and, finally, unsteady pulsations are able to influence the stage-performance particularly near the blockage-line. M.G.

N84-25973# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
DIGITAL IMAGE PROCESSING IN FLUID DYNAMICS
1984 426 p refs Lecture Ser. held at Rhode-Saint-Genese, Belgium, 5 - 9 Mar. 1984
(VKI-LS-1984-03) Avail: NTIS HC A19/MF A01

Digital image processing is a new branch of signal processing which is increasingly important with the improvement of digital computer capabilities. Topics included were numerical filtering, Fourier transformation, matrix vector algorithm methods, hardware selection, calibration, information display, pattern recognition, tomography, real time hydrography, atmospheric dispersion, combustion problems, velocity measurements, and laser visualization. For individual titles, see N84-25974 through N84-25979.

N84-25974# Vicom Systems, Inc., San Jose, Calif.
DIGITAL IMAGE PROCESSING AND ANALYSIS
William K. Pratt *In* Von Karman Inst. for Fluid Dynamics Digital Image Processing in Fluid Dyn. 1984 140 p (For primary document see N84-25973 16-34)
Avail: NTIS HC A19/MF A01

The general features of digital image processing were introduced. The following fundamental considerations were discussed: the human visual system and the digital representation of the images. B.G.

N84-25975# Stanford Univ., Calif.
OPTICAL PROCESSING **c74**
L. Hesselink *In* Von Karman Inst. for Fluid Dyn. Digital Image Processing in Fluid Dyn. 1984 110 p refs (For primary document see N84-25973 16-34)
Avail: NTIS HC A19/MF A01

Recent advances in modern optical methods and digital image processing related to fluid mechanics research were presented. The approach of Fourier optics and classical instruments, such as a schlieren system, are analyzed using this approach. This analysis does not only provide a much better understanding of the physics involved than is usually covered in fluid mechanics textbooks, but it opens up new possibilities for research, in particular in the area of digital image processing. The speckle interferometer which is used to determine statistical quantities describing a random density field is a case in point. The understanding of the basic principles involved in tomography, the advantages and disadvantages of the different techniques and current interest in the field are emphasized. The use of holography for 3-D data storage is emphasized and the role which holograms play in optical processors is indicated.
Author

N84-25976# International Business Machines S. A. E., Madrid (Spain). Scientific Center.
PLANNING AN EXPERIMENT FOR DIGITAL IMAGE PROCESSING **c61**
Javier Jimenez *In* Von Karman Inst. for Fluid Dyn. Digital Image Processing in Fluid Dyn. 1984 24 p refs (For primary document see N84-25973 16-34)
Avail: NTIS HC A19/MF A01

When a digital image processing (DIP) system is used in an experiment, it should be seen as a (fairly expensive) measuring instrument, and planned accordingly. The design criteria for the different parts of the system as a function of their intended use are determined. A short summary of the options which are available

at present for each of them are given. The core of the system is, of course, the experiment itself. If DIP is going to be of any use, some of the data in the experiment were acquired in the form of flow visualization. A careful study should be made on whether the visualization data really require digital processing. Photography is a well developed technique whose capacity to acquire and store data is still unmatched by digital means. No sensible digital system, at present, acquires data at a speed comparable to a standard 16 mm cine camera for any length of time, let alone any of the available high speed photographic systems. Moreover, the photographic emulsion is still the long term storage medium with a highest density. An economic analysis is, of course, even more in favor of analog photography. Author

N84-25977# International Business Machines S. A. E., Madrid (Spain). Scientific Center.
POST-PROCESSING: EXTRACTING AND DISPLAYING USEFUL INFORMATION FROM DIGITAL IMAGES c82
Javier Jimenez *In* Von Karman Inst. for Fluid Dyn. Digital Image Processing in Fluid Dyn. 1984 23 p refs (For primary document see N84-25973 16-34)
Avail: NTIS HC A19/MF A01

Fluid mechanics is an area in which much of the experimental information is obtained in the form of flow visualization pictures. This is specially true in the area of turbulence, where the flow properties change rapidly in space and time, and where a picture provides information on the instantaneous behavior of some variables (notably concentration of different species) over extended regions. Flow visualization movies are even better in that they show the evolution of those variables in time. Extracting information from this material usually involves two steps. First the images are processed to improve their signal to noise content and enhance desired aspects. Digital image processing is an important technique thanks to its ability to provide both relatively simple display, enhancement and measurement capabilities and high level image analysis. Thiese advantages of digital image processing are not limited to fluid mechanics but extend to all the areas in which images are an important part of the result of a experiment. Author

N84-25978# Ecole Centrale de Lyon (France).
INSTANTANEOUS CONCENTRATION AND VELOCITY MEASUREMENTS THROUGH LASER VISUALIZATION ASSOCIATED WITH A DIGITAL PROCESSING SYSTEM c35
J. P. Schon *In* Von Karman Inst. for Fluid Dyn. Digital Image Processing in Fluid Dyn. 1984 41 p refs Sponsored by Electricite de France, and DRET Ministere de l'Environnement and EEC (For primary document see N84-25973 16-34)
Avail: NTIS HC A19/MF A01

The domain of application of image processing in fluid mechanics is so wide that no theoretical limits are imagined. However, the quality of the primitive image is very important, so the visualization technique has to be performed with care. Massive use of digital image processing probably entrains a fairly different way of describing turbulent flows. Multivariable statistics adapted to thse flows will certainly be developed. Methods for describing three dimensional instantaneous velocity and concentration fields by holographic or other methods are studied. In all the cases, however, a great amount of data has to be handled. Samples of 1000 images are probably necessary for high order statistics, more definition is needed for quite a wide range of problems. So the real limits of these kind of methods are linked to the image processing performances and cost. Author

N84-25979# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
LASER SPECKLE VELOCIMETRY IN FLUID DYNAMICS APPLICATIONS c35
R. Meynart and L. M. Lourenco *In its* Digital Image Processing in Fluid Dyn. 1984 76 p refs (For primary document see N84-25973 16-34)
Avail: NTIS HC A19/MF A01

A flow visualization and velocity measurement technique is described, which permits the simultaneous visualization of instantaneous two dimensional streamline patterns in unsteady flows, and the quantification of the velocity field. The technique involves seeding the flow with small particles and lighting the plane of interest with a sheet of pulsed laser light to obtain multiple exposure photograph of the particles as they travel with the flow. The multiple particle images provide the streamlines in the limit of short duration between laser pulses. The local velocity information is retrieved using an optical method. The photographic negative is analyzed by passing a probe laser beam through each point of interest and allowing the diffraction produced by the multiple particle images to generate fringes in the Fourier plane of a lens. These fringes have an orientation which is perpendicular to the direction of the local velocity vector and a spacing which is inversely proportional to its magnitude. Author

N84-25980# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
COMPUTATIONAL FLUID DYNAMICS, VOLUME 1
1984 439 p refs Lecture Ser. held at Rhode-Saint-Genese, Belgium, 12 - 16 Mar. 1984
(VKI-LS-1984-04-Vol-1) Avail: NTIS HC A19/MF A01

Recent developments and applications of numerical methods for the study of complex problems in fluid mechanics were examined. The following topics were treated in detail: multigrid techniques in fluid dynamics; complex finite element techniques in computational fluid dynamics; advances in spectral and pseudo-spectral methods; elliptic grid generation for complex 3D configurations; recent development in implicit time dependent techniques for the solution of the Euler equations; explicit and implicit time dependent techniques for the compressible Navier-Stokes equations; and computation of vertical flows around wings. For individual titles, see N84-25981 through N84-25985.

N84-25981# Weizmann Inst. of Science, Rehovoth (Israel).
MULTIGRID TECHNIQUES: THE 1984 GUIDE WITH APPLICATIONS TO FLUID DYNAMICS
In Von Karman Inst. for Fluid Dynamics Computational Fluid Dyn., Vol. 1 1984 188 p refs (For primary document see N84-25980 16-34)
Avail: NTIS HC A19/MF A01

Multigrid techniques and insights are summarized. These techniques are then applied to fluid dynamics. The following topics are discussed: boundary value problems, relaxation, smoothing factors, full multigrid algorithms, Cauchy-Riemann equations, Navier-Stokes equations, Euler equations, multigrid improvements, and artificial viscosity in quasi-linear formulations. B.G.

N84-25982# Tennessee Univ., Knoxville.
FINITE ELEMENTS IN COMPUTATIONAL FLUID DYNAMICS
A. J. Baker *In* Von Karman Inst. for Fluid Dynamics Computational Fluid Dyn., Vol. 1 1984 36 p refs (For primary document see N84-25980 16-34)
Avail: NTIS HC A19/MF A01

Finite element theory is a formal mathematical procedure for construction of discrete and/or semidiscrete approximations to solutions of differential equation problem descriptions in mechanics. The classical theory is founded on analytical concepts in the calculus of constrained variational boundary value problems. The extension to problem descriptions in computational fluid dynamics requires interpretation of these classical precepts within a weak statement or weighted residuals framework. The fundamental aspects are introduced and implementation and applications throughout a relatively broad problem class in computational fluid dynamics are cited. Author

N84-25983# Mississippi State Univ., Mississippi State. Dept. of Aerospace Engineering
GENERATION OF THREE DIMENSIONAL GRIDS THROUGH ELLIPTIC DIFFERENTIAL EQUATIONS c64
Z. U. A. Warsi *In* Von Karman Inst. of Fluid Dynamics Computational Fluid Dyn., Vol. 1 1984 71 p refs (For primary document see N84-25980 16-34)
(Grant AF-AFOSR-0185-80)

Avail: NTIS HC A19/MF A01

The development and the numerical solution of second order elliptic partial differential equations for the generation of both two and three dimensional curvilinear coordinates around bodies of arbitrary shapes are examined. Since the main aim is the consideration of the problems of coordinate generation through elliptic partial differential equations, first of all, those necessary formulae were listed which are of permanent interest in forming various mathematical models leading to elliptic equations. Next, the computational problems of solving the equations for the generation of two and three dimensional coordinates, both nonorthogonal and orthogonal were discussed. Finally, the computational results from a three dimensional coordinate generation program based on the formulae of Gauss and Beltrami were discussed. Author

N84-25984# Mississippi State Univ., Mississippi State.
THE IMPORTANCE OF DYNAMICALLY-ADAPTIVE GRIDS IN THE NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS **c67**
Z. U. A. Warsi and J. F. Thompson *In* Von Karman Inst. for Fluid Dynamics Computational Fluid Dyn., Vol. 1 1984 46 p refs (For primary document see N84-25980 16-34)
(Grant AF-AFOSR-0185-80)
Avail: NTIS HC A19/MF A01

The basic philosophy and methodology in the construction of dynamically adaptive coordinate systems for use in the numerical solution of partial differential equations were surveyed. The adaptive grids are intrinsically coupled with the physical field solution being done on the grid so that the grid points continually move in response to the developing gradients or variations in the solutions. The elliptic generation equations are also based on the variational principles and therefore the methods based on the explicit use of variational principles and those based on elliptic equations have considerable commonality. A survey of various available solutions on adaptive grids shows that the dynamic grid adaption removes the oscillations common when strong gradients occur on fixed grids. The importance of adaptive grids in the numerical solution of field equations lies in the fact that once the grid adapts to the solution, all the problems associated with the nonlinear oscillations and stability are removed. Author

N84-25985# Universite Catholique de Louvain (Belgium).
RECENT DEVELOPMENTS OF SPECTRAL AND PSEUDOSPECTRAL METHODS IN FLUID DYNAMICS
Michell Deville *In* Von Karman Inst. for Fluid Dynamics Computational Fluid Dyn., Vol. 1 1984 81 p refs (For primary document see N84-25980 16-34)
Avail: NTIS HC A19/MF A01

Chebyshev spectral schemes are operational and constitute a real tool to investigate convection dominated flows modeled by the Navier-Stokes equations with constant coefficients. Three dimensional flows in simple geometries are easily simulated. Despite their accuracy and moderate cost, Chebyshev spectral approximations lack generality in the treatment of variable coefficients and arbitrary geometrics to claim to be an engineering tool. On the contrary, pseudospectral schemes using finite difference or finite element preconditioning take advantage of the good know-how every numericist has and may get firm support from well designed algebraic solvers. Pseudospectral methods are not yet widely used, but they realize a class of algorithms which have general capabilities (nonlinearities, nonconstant coefficients, complex geometries, etc.) and, therefore call for further expansion to handle properly the difficult problems occurring in fluid dynamics. Author

N84-25986# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
COMPUTATIONAL FLUID DYNAMICS, VOLUME 2
1984 395 p refs Lecture Ser. held at Rhode-Saint-Genese, Belgium, 12 - 16 Mar. 1984 2 Vol.
(VKI-LS-1984-04-Vol-2) Avail: NTIS HC A17/MF A01

Various examples for Euler and Navier-Stokes equations in the solution of computational fluid dynamic flow problems are described. Topics include vortical flow around several wing configurations, implicit time dependent solutions for transonic flows, multigrid techniques for Euler equation solutions, and turbulent flow applications of the Navier-Stokes equations. For individual titles, see N84-25987 through N84-25991.

N84-25987# National Aerospace Lab., Amsterdam (Netherlands).
NUMERICAL COMPUTATION OF VORTICAL FLOWS ABOUT WINGS **c02**
H. W. M. Hoeijmakers *In* Von Karman Inst. for Fluid Dynamics Computational Fluid Dyn., Vol. 2 1984 142 p refs (For primary document see N84-25986 16-34)
Avail: NTIS HC A17/MF A01

Computational methods for vortex wakes and flow predictions of vortical type configurations are investigated. Vortex flow computation associated with separation from the leading, side, and trailing edges is discussed. These methods are directed toward three dimensional subsonic steady flow applications. M.A.C.

N84-25988*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RECENT DEVELOPMENTS IN MULTIGRID METHODS FOR THE STEADY EULER EQUATIONS
Dennis C. Jespersen *In* Von Karman Inst. for Fluid Dynamics Computational Fluid Dyn., Vol. 2 1984 71 p refs (For primary document see N84-25986 16-34)
Avail: NTIS HC A17/MF A01 CSCL 20D

The solution by multigrid techniques of the steady inviscid compressible equations of gas dynamics, the Euler equations is investigated. Steady two dimensional transonic flow over an airfoil section is studied intensively. Most of the material is applicable to three dimensional flow problems of aerodynamic interest. M.A.C.

N84-25989# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
IMPLICIT TIME DEPENDENT METHODS FOR THE SOLUTION OF THE EULER EQUATIONS
A. Lerat *In* Von Karman Inst. for Fluid Dynamics Computational Fluid Dyn., Vol. 2]date] 50 p refs (For primary document see N84-25986 16-34)
Avail: NTIS HC A17/MF A01

Centered implicit methods are analyzed for the solution of the Euler equations, with subsequent description of transonic flows. Linear and nonlinear hyperbolic systems are examined and an implicit scheme is described for steady and unsteady problems. The effects of nonlinearities and boundary conditions on stability are considered. An extension to the Navier-Stokes equation is outlined. M.A.C.

N84-25990# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
IMPLICIT TIME DEPENDENT METHODS FOR THE SOLUTION OF THE EULER EQUATIONS. PART 2: APPLICATION TO TRANSONIC FLOWS
J. Sides *In* Von Karman Inst. for Fluid Dynamics Computational Fluid Dyn., Vol. 2 1984 29 p refs (For primary document see N84-25986 16-34)
Avail: NTIS HC A17/MF A01

Numerical implicit methods are examined for an efficient solution of the unsteady compressible Euler equations. The interest of implicit methods lies in the fact that they can theoretically benefit from the absence of any limitation on the choice of the time step. Basic implicit schemes are applied to the solution of realistic flow problems governed by the Euler equations. The implicit finite volume method is also considered. M.A.C.

N84-25991# Universite des Sciences et Techniques de Lille (France).
SOLUTION OF THE COMPRESSIBLE NAVIER-STOKES EQUATIONS: APPLICATIONS TO COMPLEX TURBULENT FLOWS
Dany D. Vandromme and H. Haminh (Inst. de Mecanique des Fluides, Toulouse) Von Karman Inst. for Fluid Dynamics Computational Fluid Dyn., Vol. 2 1984 110 p refs (For primary document

see N84-25986 16-34)
Avail: NTIS HC A17/MF A01

Flow calculation results obtained with sophisticated turbulent models are presented with time steps quite comparable to compressible laminar flow calculation performances. A global approach for solving viscous/inviscid interaction problems everywhere in the flow domain is examined. Consideration of modelling problems for turbulent flow and the development of a standard model is included. Various applications using the turbulent flow schemes of the Navier-Stokes equations are described in detail.
M.A.C.

N84-25992# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
NUMERICAL AND OPTICAL EXPERIMENTS ON THE WEISSENBERG EFFECT Ph.D. Thesis - Karlsruhe Univ.
Georg Eitelberg Dec. 1983 105 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-84-04) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 29,50

The axisymmetric creeping shear flow of a second order fluid in the annulus between two coaxially mounted cylinders, with the inner cylinder rotating, is studied. The shape of the free liquid surface, dependent on the material and geometry parameters, is numerically calculated and experimentally measured by means of holographic interferometry. Special consideration is given to the viscous heating and the existence of a secondary flow in the cylindrical geometry. Author

N84-25993# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
THREE-DIMENSIONAL LAMINAR SEPARATION Final Report, May 1982 - Aug. 1984
D. P. Telionis and C. E. Costis Dec. 1983 68 p
(Contract N00167-82-K-0085)
(AD-A140378; VPI-E-83-48; DTNSRDC/ASED-CR-04-83) Avail: NTIS HC A04/MF A01 CSCL 20/4

Simple methods for obtaining estimates of skin-friction lines and separation lines are discussed. Results for prolate spheroids and ellipsoids are compared with earlier detailed numerical studies. Flow visualizations of the regions of interest are presented and compared with the calculated results. Streamwise and cross flow velocity profiles measured by Laser Doppler Velocimeter are displayed. Author (GRA)

N84-25994# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
COHERENT STRUCTURE MODELING OF VISCOUS SUBLAYER TURBULENCE FOR INCOMPRESSIBLE FLOW WITH HEAT TRANSFER AND FOR COMPRESSIBLE FLOW Annual Scientific Report, 1 Jan. - 31 Dec. 1983
D. K. Ota and D. R. Chapman Feb. 1984 45 p
(Grant AF-AFOSR-0083-82; AF Proj. 2307)
(AD-A140478; SUDAA-AA-CFD-84-1; AFOSR-84-0248TR; ASR-2) Avail: NTIS HC A03/MF A01 CSCL 20/4

The general objective of the present research is to develop a Navier-Stokes computational model of the time-dependent dynamics and heat transfer in a compressible viscous sublayer. The main objective is to compute the variation of turbulent Prandtl number across the sublayer. Experiments have been unable to define this variation, and existing theories differ greatly. A computational code has been developed using preliminary, relatively simple temperature and velocity boundary conditions at the outer edge of the sublayer. Computations have been made for molecular Prandtl numbers from 0.7 to 6 with zero pressure gradient, and for adverse, zero, and favorable pressure gradient, with a Prandtl number of 0.7. These preliminary results show a strong effect of molecular Prandtl number on turbulent Prandtl number near the wall; but only a relatively small effect of pressure gradient throughout the sublayer. Future computations will be made with more refined boundary conditions. Author (GRA)

N84-25995# Stanford Univ., Calif.
EFFECTIVE VISCOSITY OF A PERIODIC SUSPENSION
K. C. Nunan and J. B. Keller 1984 35 p
(AD-A140483) Avail: NTIS HC A03/MF A01 CSCL 20/4

The effective viscosity of a suspension is defined to be the four-tensor which relates the average deviatoric stress to the average rate of strain. The effective viscosity of an array of spheres centered on the points of a periodic lattice in an incompressible Newtonian fluid is determined. The formulation involves the traction exerted on a single sphere by the fluid, and an integral equation for the traction is derived. For lattices with cubic symmetry the effective viscosity tensor involves just two parameters. These are computed numerically for simple, body-centered and face-centered cubic lattices of spheres with solute concentrations up to 90% of the close-packing concentration. Asymptotic results for high concentrations are obtained for arbitrary lattice geometries, and found to be in good agreement with the numerical results for cubic lattices. The low concentration asymptotic expansions of Zuzovsky also agree well with the numerical results. Author (GRA)

N84-25996# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF COHERENT STRUCTURE IN THE TURBULENT BOUNDARY LAYER Final Scientific Report, 1 May 1978 - 30 Jun. 1983
C. R. Smith, J. D. A. Walker, and D. E. Abbott Jun. 1983 52 p
(Contract F49620-78-C-0071; AF Proj. 2307)
(AD-A140517; AFOSR-84-0246TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

This program combines both experimental flow visualization studies with analytical investigations of a series of phenomenological and theoretical models based upon three-dimensional, vortical flow structures developing and interacting in proximity to a solid surface. The experimental program considered a range of subproblems including the effect of surface modifications on low-speed streak formation and drag, and the effect of vortex loop inter-action with a solid boundary. To augment visual studies, a computerized interface with the video system has been developed which allows quantitative data to be obtained from flow visualization pictures. The specific thrust of the theoretical studies has been focussed on three areas: (1) how two and three-dimensional vortex structures interact with wall boundary layers; (2) the development of a new type of prediction method for two-dimensional turbulent boundary-layer flows; and (3) improvement in numerical techniques for solving parabolic, boundary-layer equations. GRA

N84-25997# Boeing Military Airplane Development, Seattle, Wash.
MULTI-LENGTH SCALE TURBULENCE MODELS Final Report, 15 Apr. 1982 - 18 Jul. 1983
S. F. Birch Aug. 1983 50 p
(Contract F49620-82-C-0032; AF Proj. 2307)
(AD-A140527; AFOSR-84-0249TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

Development of a new two-length scale turbulence model is described. This work was undertaken because the performance of current models for certain flows appears to be limited by an inadequate treatment of the turbulence length scale. One flow for which current turbulence models are not adequate is the initial developing region of a plane mixing layer. Available mixing layer data is briefly reviewed. An improved ability to analyze this flow is required for improved prediction of the near field of a jet for a wide range of applications including those for STOL aircraft applications. The work was performed in the context of developing an improved turbulence model for general application to complex three-dimensional jets. The new model is based on the physical observation that the turbulence shear stress and the turbulence energy production are associated primarily with the large scale eddies, while most of the turbulence energy is dissipated by small scale eddies near the high frequency end of the turbulence energy spectrum. Therefore, except for flows close to equilibrium, separate turbulence length scales are required to characterize the large and small scale motions. GRA

N84-25998# California Inst. of Tech., Pasadena. Earthquake Engineering Research Lab.
AN EMPIRICAL MODEL FOR VORTEX-INDUCED VIBRATIONS Ph.D. Thesis
Dirceu Luiz Ridrigues Botelho 1983 135 p refs Sponsored in part by the National Science Foundation
(PB84-161157; EERL-82-02) Avail: NTIS HC A07/MF A01 CSCL 20D

The analysis of vortex-excited transverse oscillations of flexibly-mounted circular cylinders in a uniform flow is presented through an analytical-empirical approach. A new model is derived, assuming spanwise constant flow velocity within the sub-critical range of Reynolds numbers and using only experimental data obtained from forced cylinders in water. The steady-state response of flexibly-mounted cylinders is obtained as a function of the structural system and flow parameters and its stability is analyzed. Several characteristics and its stability is analyzed. Several characteristics observed experimentally and also present in the model response are discussed. The resultant model's capability for predicting structural response for a wide range of fluid mediums is illustrated through comparisons between model predictions and results obtained experimentally from flexibly-mounted cylinders in air and in water. The model developed is expected to yield better results for structures in water, by virtue of being based only on experimental results obtained in water. Author (GRA)

N84-25999# Minnesota Univ., Minneapolis.
SECOND-ORDER EFFECTS IN COMPLEX RHEOLOGICAL FLOWS Ph.D. Thesis
Hao Anh Tieu 1983 214 p
Avail: Univ. Microfilms Order No. DA8404246

The interfacial shape of two immiscible simple fluids in a vertical cylinder which oscillates about its axis is investigated using the theory of domain perturbations. The perturbation stresses are expressed by integrals over the history of the deformation. At first order the azimuthal velocity field satisfies the requirements of continuity in velocity and shear stresses across the interface. At second order the solution consists of a mean part and a time periodic part varying at twice the frequency of the cylinder. The mean problem is inverted for the mean secondary flow, pressure and interfacial shape. Experimental data for two polymeric oils (TLA227 and STP) show qualitative agreement with theoretical predictions for the mean interfacial shapes. Dissert. Abstr.

N84-26000# California Inst. of Tech., Pasadena.
ELEMENT-BY-ELEMENT SOLUTION PROCEDURES FOR NONLINEAR TRANSIENT HEAT CONDUCTION ANALYSIS Ph.D. Thesis
James Michael Winget 1984 186 p
Avail: Univ. Microfilms Order No. DA8404520

The development of algorithms was undertaken whose resource needs grow only linearly with problem size. In addition, these new algorithms will fully exploit the parallel processing capability available in the new generation of multiprocessor computers. The approach taken in the element by element solution procedures is to approximate the global implicit operator by a product of lower order operators. This type of product approximation originated with ADI techniques and was further refined into the method of fractional steps. The current effort involves the use of a more natural operator split for finite element analysis based on element operators. This choice of operator splitting based on element operators has several advantages. First, it fits easily within the architecture of current FE programs. Second, it allows the development of parallel algorithms. Finally, the computational expense varies only linearly with the number of elements. The particular problems considered arise from nonlinear transient heat conduction. Dissert. Abstr.

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N84-26001 Case Western Reserve Univ., Cleveland, Ohio.
OPTIMIZATION METHODS IN HIERARCHICAL HOLOGRAPHIC MODELING Ph.D. Thesis
Jacob Thadathil 1983 406 p
Avail: Univ. Microfilms Order No. DA8405260

The mathematical formulation of the hierarchical holographic modeling and solution methodology are explored. The hierarchical multiobjective optimization (HMO) methods that have been developed so far are useful mostly for the analysis of large scale systems which are controlled and managed by one planning group only. The mathematical representation of the HHM in a generic case and the effects of multiple decompositions on the decision vectors, multiobjective vectors and constraints vectors in three HHSubmodel cases are explored. The solution methodology of two hierarchical holographic submodels (HHS) is considered. Two algorithms, namely the Hierarchical Holographic Overlapping Coordination algorithm and the Hierarchical Holographic Feasible scheme are proposed for generating pareto optimal solutions of the HHSs. The coupling resource allocation problem faced by the upper level group, between two HHSs is addressed. The applicability of the HHM scheme to a hypothetical river basin related land resource management problem is explored. Author

N84-26002 National Physical Lab., Teddington (England). Div. of Quantum Metrology.
[ACTIVITIES REPORT OF THE DIVISION OF QUANTUM METROLOGY] Annual Report, 1982
Feb. 1984 25 p refs
(NPL-QU-AR-82; ISSN-0309-3050) Copyright. Avail: Issuing Activity

The development of metrological standards and techniques was discussed. Standards for temperature measurement, thermal conductivity, optical measurement, and environmental pollution measurement were reviewed. Measuring instruments and techniques including thermometers, thermocouples, colorimetry, photometry, and spectroradiometers were cited. The triple point of gallium, thermal conductivity standards in energy conservation, ultraviolet and far ultraviolet radiometry, and upper atmosphere measurement were emphasized. R.S.F.

N84-26003 Institut d'Aeronomie Spatiale de Belgique, Brussels.
A SAMPLE PERFORMANCE OF THE GRILLE SPECTROMETER ABOARD SPACELAB
M.-P. Lemaitre, J. Laurent, J. Besson, A. Girard, C. Lippens, C. Muller, J. Vercheval, and M. Ackerman 1984 13 p refs Submitted for publication Sponsored by Belgian Ministries of Education and Science Policy, CNES and French Ministry of Research and Industry
(Aeronomica-Acta-A-281-1984) Avail: Issuing Activity

Preliminary results of the grille spectrometer flown on the Spacelab One mission intend only to show the quality of the obtained spectral data. Among ten trace species observed in the atmosphere, methane was chosen for the spectacular aspect of Q branch of the intense upsilon 3 band. Other molecules, as well as the atmospheric significance of the results, will be discussed elsewhere. Author

N84-26004# Department of Energy, New York. Environment Measurements Lab.
APPLICATION OF SEMI-EMPIRICAL Ge(Li) DETECTOR CALIBRATION TECHNIQUE FOR LARGE VOLUME SAMPLES
Tianshan Ren and Kevin M. Miller Feb. 1983 38 p refs

(DE83-012801; DOE/EML-409) Avail: NTIS HC A03/MF A01

A previously developed semi-empirical method for the calculation of the absolute peak efficiency of coaxial Ge(Li) detectors for large volume samples is reviewed and applied using a computer model and experimental determinations of calibration parameters. The efficiencies calculated for extended air, lucite and aluminum source materials are compared with those obtained with spiked sample calibrations and point source calibrations. The errors are within + or -5% in most cases. For the calibrations, two versions of computer programs written in FORTRAN are presented. Author

N84-26005# Materials Research Labs., Melbourne (Australia). Metallurgy Div.

THE NICROSIL VERSUS NISIL TYPE N THERMOCOUPLE: A COMMERCIAL REALITY

N. A. Burley, J. W. Hobson (Department of Defence), and A. Paine (Leeds and Northrup Australia Pty Ltd.) Oct. 1983 69 p refs

(MRL-R-903; AR-003-799) Avail: NTIS HC A04/MF A01

The nicrosil versus nisil thermocouple system were compared. The adoption of the new thermocouple in science and industry is emphasized. Various aspects of the formulation, development, standardization, laboratory and industrial testing, and the commercial adoption and utilization of the nicrosil versus nisil system are presented. E.A.K.

N84-26006# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

BASIC ELEMENTS OF THE TILTING FILTER PHOTOMETER [ELEMENTOS BASICOS SOBRE FOTOMETROS DE FILTRO INCLINAVEL]

Volker W. J. H. Kirchhoff May 1984 30 p refs In PORTUGUESE; ENGLISH summary

(INPE-3124-MD/026) Avail: NTIS HC A03/MF A01

The tilting filter photometer has wide application in the study of natural airglow phenomena. The photometer is used to monitor the emitted radiation intensity, and the data have great scientific value. The Fabry-Perot interferometer, interference filters, data reduction, optical considerations, and measurement results are analyzed. Author

N84-26007*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

NEW TECHNIQUE FOR CALIBRATING HYDROCARBON GAS FLOWMETERS

Jag J. Singh and Richard L. Puster Jun. 1984 32 p refs

(NASA-TM-85792; L-15788; NAS 1.15:85792) Avail: NTIS HC A03/MF A01 CSCL 14B

A technique for measuring calibration correction factors for hydrocarbon mass flowmeters is described. It is based on the Nernst theorem for matching the partial pressure of oxygen in the combustion products of the test hydrocarbon, burned in oxygen-enriched air, with that in normal air. It is applied to a widely used type of commercial thermal mass flowmeter for a number of hydrocarbons. The calibration correction factors measured using this technique are in good agreement with the values obtained by other independent procedures. The technique is successfully applied to the measurement of differences as low as one percent of the effective hydrocarbon content of the natural gas test samples. Author

N84-26008*# Kentucky Univ., Lexington. Dept. of Mechanical Engineering.

DEVELOPMENT OF LIMB VOLUME MEASURING SYSTEM Final Report, 1 Nov. 1977 - 30 Sep. 1983

Pramode K. Bhagat and Prasad K. Kadaba Oct. 1983 151 p refs

(Contract NAS9-15452)

(NASA-CR-171789; NAS 1.26:171789) Avail: NTIS HC A08/MF A01 CSCL 14B

The mechanisms underlying the reductions in orthostatic tolerance associated with weightlessness are not well established. Contradictory results from measurements of leg volume changes suggest that altered venomotor tone and reduced blood flow may not be the only contributors to orthostatic intolerance. It is felt that a more accurate limb volume system which is insensitive to environmental factors will aid in better quantification of the hemodynamics of the leg. Of the varous limb volume techniques presently available, the ultrasonic limb volume system has proven to be the best choice. The system as described herein is free from environmental effects, safe, simple to operate and causes negligible radio frequency interference problems. The segmental ultrasonic ultrasonic plethysmograph is expected to provide a better measurement of limb volume change since it is based on cross-sectional area measurements. Author

N84-26009# National Aerospace Lab., Tokyo (Japan).

EVALUATION OF THERMOCOUPLE AND THERMAL RADIATION INSTRUMENTATION FOR MEASURING GAS TURBINE COMBUSTOR LINER TEMPERATURE

1983 13 p refs In JAPANESE; ENGLISH summary

(NAL-TR-784; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Temperature measurement techniques for a practical combustion chamber liner wall were investigated. Fourteen ways of sheathed thermocouple installations on thin stainless steel plated simulating a combustor liner wall were tested by flowing a hot gas on one side and cold air on the other side under atmospheric conditions. The temperature range of the hot gas and the cold air were 542 to 612 K and 317 to approximately 326 K, respectively. The tested stream velocities were in the ranges of 70 to approximately 87 m/s for the hot gas and 14 to approximately 70 m/s for the cold gas. Reynolds numbers of the hot and cold streams have no significant effects on the magnitude of the error and only the method of installation determines the accuracy of the measurements. Radiation measurements of the black coated wall surface may cause significant error because there is a big temperature gradient across the coating layer. Author

N84-26010*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THREE COMPONENT VELOCITY MEASUREMENTS USING FABRY-PEROT INTERFEROMETER

Richard G. Seasholtz and Louis J. Goldman 1984 8 p refs Presented at the 2nd Intern. Symp. on Appl. of Laser Anemometry to Fluid Mech., Lisbon, 2-4 Jul. 1984

(NASA-TM-83692; E-2148; NAS 1.15:83692) Avail: NTIS HC A02/MF A01 CSCL 14B

A method for measuring the three components of mean flow velocity using a backscatter optical system based on a confocal Fabry-Perot interferometer is described. An analysis of the expected uncertainties in the velocity component measurements is presented along with experimental data taken in a free jet at two flow velocities (100 and 300 m/s). Author

N84-26011*# California Inst. of Tech., Pasadena. Lab. for Seismology.

A SENSITIVE OPTICAL PYROMETER FOR SHOCK-TEMPERATURE MEASUREMENTS

Mark B. Boslough and Thomas J. Ahrens 1984 21 p refs

(Grants NGL-05-002-105; NSF EAR-81-16026)

(NASA-CR-173602; NAS 1.26:173602; CIT-CONTRIB-4073) Avail: NTIS HC A02/MF A01 CSCL 14B

A new optical system was used to determine temperatures above 2400 K in shocked materials by measuring the spectral radiance of sub-microsecond pulses of light emitted from initially transparent solid samples in the visible and near infrared (450 to 900 nm). The high sensitivity of this optical pyrometer is attributed to the small number of channels, large aperture (0.03 steradian), the large bandwidth per channel (40 nm), and large photodiode detection area (0.2 sq cm). Improved calibration techniques reduce systematic errors encountered in previous shock-temperature experiments. Author

N84-26012# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

STRESS GAGES

P. J. Sevennuijsen 18 Mar. 1983 9 p Presented at Brit. Soc.

for Strain Meas./Royal Aeron. Soc. Joint Conf. 1982 on State-of-the-Art in Meas. Tech., Guildford, England, 6-9 Sep. 1982 Submitted for publication
(AD-B080780; NLR-MP-83022-U) Avail: NTIS HC A02/MF A01 CSCL 14/2

It is strange that for experimental stress analysis, stress gages are used far less than strain gages. A comprehensive discussion on the theory and application of the V-type stress gage is presented. A comparison with the strain gage is also presented. Author

N84-26013# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
PRODUCT ASSSURANCE REQUIREMENTS FOR MICRO VCM-APPARATUS AND ASSOCIATED EQUIPMENT
Oct. 1982 19 p refs
(ESA-PSS-01-711-Issue-1; ISSN-0379-4059) Avail: NTIS HC A02/MF A01

The rules for performing Micro VCM-tests (vacuum tests) on materials for European Space Agency projects are presented. Formal guidelines for initial audits along with annual and special quality assurance reviews are summarized. Inspection forms are displayed. R.S.F.

N84-26014# European Space Agency, Paris (France).
INVESTIGATIONS ON THE LOCK-IN PROBLEM AND THE READOUT TECHNIQUE OF LASER GYROS
Ruediger Rodloff May 1983 125 p refs Transl. into ENGLISH of "Untersuchungen zum lock-in-probl. u. zur signalauslesung an laserkreiseln" rept. DFVLR-FB-81-39 DFVLR, Brunswick, Apr. 1981
(ESA-TT-773; DFVLR-FB-81-39) Avail: NTIS HC A06/MF A01; Original German report available from DFVLR, Cologne DM 26,60

The basic effects of the laser gyro is discussed. An analytical model for describing the lock in phenomenon is derived and compared with experimental results. Different readout techniques, especially single beam readout, and compensation of the bias induced to avoid the lock in effect are outlined. Measurement results for an experimental laser gyro are presented. E.A.K.

N84-26015# European Space Agency, Paris (France).
AUTOMATICALLY EQUALIZING FLUID MANOMETER COMBINED WITH A COMPUTER
Eberhard Froebel Sep. 1983 21 p refs Transl. into ENGLISH of "Automatisch abgleichendes fluessigkeitsmanometer mit rechner" rept. DFVLR-Mitt-82-15 DFVLR, Goettingen, West Germany, Oct. 1981
(ESA-TT-811; DFVLR-Mitt-82-15) Avail: NTIS HC A02/MF A01; original German report available from DFVLR, Cologne DM 9,40

A system of equations is derived for the state variables of moist air, that allows velocity to be determined by pressure tube measurement with high accuracy. Relationships are assumed as would occur in the case of wind tunnel measurements for example. The equations are set up for a microprocessor which automatically records measured values of the state variables, calculates the velocity, and outputs the results in suitable form. In this way the capabilities of a previously described pressure difference measuring system are significantly enhanced. Author

N84-26016# Naval Postgraduate School, Monterey, Calif.
HOLOGRAPHIC INVESTIGATION OF SOLID PROPELLANT COMBUSTION PARTICLES M.S. Thesis
P. J. Mellin Dec. 1983 43 p
(AD-A140168) Avail: NTIS HC A03/MF A01 CSCL 21/9

This investigation continued the development of a method for obtaining high quality holograms of the combustion products from aluminized solid rocket motor propellants burned in a two-dimensional motor to provide a cross-flow environment. The use of glass side plates as a motor casing provided both a convenient construction technique and allowed good quality holograms to be obtained. At combustion pressures above 500 psia and propellant slab thicknesses greater than 0.080 inches, the timing of the laser pulse during the burn was found to be critical, since an extremely short time interval existed between the establishment of steady state slab burning and the generation of too much smoke/combustion products to permit laser penetration. As desired operating pressures increase and aluminum powder particle sizes decrease, it will probably be necessary to use thinner propellant slabs. Author (GRA)

N84-26017# International Business Machines Corp., San Jose, Calif.
THE DEVELOPMENT OF A NEW CLASS OF HOLOGRAPHIC MATERIALS Final Report, 16 Nov. 1981 - 31 Dec. 1983
D. M. Burland 4 Apr. 1984 18 p
(Contract DAAG29-82-C-0001)
(AD-A140298; ARO-18381.4-CH) Avail: NTIS HC A02/MF A01 CSCL 14/5

The research described in this final report involves the development of a new class of holographic materials. These materials exhibit two-photon photochemistry and thus are quadratic in their photochemical response to the intensity of the two recording laser beams. Unlike other previously suggested two-photon systems, the systems we have been developing can be used with milliwatts as opposed to megawatts of laser power. The holographic material consists of a photoactive organic molecule embedded in a polymer host. Grain free holograms can thus be recorded and no development or fixing step is necessary. Work has focused on four different areas: (1) Investigation of new two-photon holographic materials, particularly ones with higher maximum holographic efficiency; (2) Demonstration of gating of the holographic recording process using an auxiliary light source; (3) Development of two-photon holographic materials which respond to infrared laser wavelengths and their application in gated holography; and (4) Production of simple holographic optical elements using these materials. GRA

N84-26018# Enertec, Velizy (France).
STUDY OF FUTURE RECORDERS FOR ESA Final Report [ETUDE ENREGISTREURS FUTURS DE L'ESA]
Paris ESA 1983 22 p In FRENCH
(Contract ESA-5084/82/NL-HP(SC))
(ESA-CR(P)-1864) Avail: NTIS HC A02/MF A01

A test bench, developed for analyzing very powerful tapes, is capable of characterizing the magnetic qualities of a tape (drop out test) on a group of tracks in a single pass of the tape before the head. With associated electronics for signal processing, statistics (variance, distribution by track, correlation among tracks) of bit error rate noise (without an error correcting code) are established. A plan is described for studying systems requirements for two recorder configurations. The evolution of specifications, requirements for space recorders, feasibility, and a financial plan for each configuration are examined. A.R.H.

N84-25873# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CHARACTERIZATION OF PRESSURE TRANSDUCERS FOR FUTURE CRYOGENIC WIND TUNNELS
M. Portat and F. Helias *In its* La Rech. Aerospatiale, Bimonthly Bull., No. 1983-6, 217/Nov.-Dec. Apr. 1984 p 35-40 (For primary document see N84-25870 16-31)
Avail: NTIS HC A04/MF A01; HC available at ONERA, Paris FF 55; original report in FRENCH available at ONERA, Paris FF 60

N84-25892*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
MAGNETICALLY ENHANCED HYDROGEN GAS DISSOCIATOR: A PROGRESS REPORT
G. Lee, T. K. Tucker, and L. Mateki *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 19-23 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 14B

N84-25902*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
TIME INTERVAL ERRORS OF A FLICKER-NOISE GENERATOR

C. A. Greenhall *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 126-135 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 14B

N84-25978# Ecole Centrale de Lyon (France).
INSTANTANEOUS CONCENTRATION AND VELOCITY MEASUREMENTS THROUGH LASER VISUALIZATION ASSOCIATED WITH A DIGITAL PROCESSING SYSTEM
J. P. Schon *In* Von Karman Inst. for Fluid Dyn. Digital Image Processing in Fluid Dyn. 1984 41 p refs Sponsored by Electricite de France, and DRET Ministere de l'Environnement and EEC (For primary document see N84-25973 16-34)
Avail: NTIS HC A19/MF A01

N84-25979# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
LASER SPECKLE VELOCIMETRY IN FLUID DYNAMICS APPLICATIONS
R. Meynart and L. M. Lourenco *In its* Digital Image Processing in Fluid Dyn. 1984 76 p refs (For primary document see N84-25973 16-34)
Avail: NTIS HC A19/MF A01

N84-26240# Battelle Inst., Frankfurt am Main (West Germany).
DEFINITION AND DESIGN OF SPACEBORNE LIDAR INSTRUMENTS
M. Endemann *In its* Appl. of Laser for Climatol. and Atmospheric Res. Oct. 1983 114 p refs (For primary document see N84-26237 16-47)
(Contract ESTEC-4868/81/NL-HP(SC))
Avail: NTIS HC A16/MF A01

N84-26447 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
MULTIPROFILE-STREAK TECHNIQUE
Manfred B. Held and Peter P. Nikowitsch *In its* Tech. and Sci. Publ. 1983 1983 p 287-197 refs Presented at 15th Intern. Congr. on High Speed Phot. and Photonics, San Diego, Calif., 21-27 Aug. 1982 (For primary document see N84-26430 16-81)
(MBB-UA-776-83-O) Avail: Issuing Activity

N84-26449 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
IMAGE QUALITY OF PASSIVE AND ACTIVE SCANNERS
Otto Hoffmann *In its* Tech. and Sci. Publ. 1983 1983 p 311-327 refs In GERMAN; ENGLISH summary (For primary document see N84-26430 16-81)
(MBB-UA-684-83-O) Avail: Issuing Activity

36 LASERS AND MASERS

Includes parametric amplifiers.

N84-26019 Rationalisierungs-Kuratorium der Deutschen Wirtschaft e.V., Frankfurt (West Germany).
LASER TECHNOLOGY: MATERIAL FOR SEPARATING, JOINING AND SURFACE TREATING [LASERTECHNOLOGIE: EINSATZ ZUM TRENNEN FUEGEN UND OBERFCAECHENBEHANDELN]
Gerhard Dippel, Ute vonRibbeck, Eberhard Roeder, and Peter Steinmueller Mar. 1983 60 p refs In GERMAN
(RKW-836) Copyright. Avail: Issuing Activity

Industrial application of laser technology is discussed. Laser radiation techniques, like cutting, welding and surface finishing are outlined. The potential application of laser techniques is concentrated on laser cutting, marketing potentials for laser technology, application, and industrial procedures in which laser cutting is applied are examined. Transl. by E.A.K.

N84-26020# Materials Research Labs., Melbourne (Australia). Physics Div.
CHARACTERISTICS OF A PLASMA-INJECTION-CONTROLLED DISCHARGE FOR CO2 MIXING LASERS
R. McLeary and P. J. Beckwith Apr. 1984 22 p refs
(MRL-R-922; AR-003-904) Avail: NTIS HC A02/MF A01

The characteristics of continuous electric discharges which were used in high power carbon dioxide mixing lasers are outlined. The discharges in nitrogen at atmospheric pressure are stabilized by the plasma injection technique. Discharge characteristics are presented for a range of discharge dimensions, preionizing discharge currents and gas flow rates. Specific input energies as high as 900 kJ/kg are accomplished. E.A.K.

N84-26021# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
BASIC ELEMENTS OF LASER RADAR [ELEMENTOS BASICOS SOBRE O RADAR DE LASER]
Volker W. J. H. Kirchhoff May 1984 22 p refs In PORTUGUESE; ENGLISH summary Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico, and by FINEP
(INPE-3123-MD/025) Avail: NTIS HC A02/MF A01

Laser radar represents a remote sensing technique which is very useful for upper atmospheric studies. Some of the major components of the system are discussed. The radar equation is deduced to show how the reception signal depends on several parameters. The transmission system (the laser) is discussed in terms of its basic physics. The real time data obtained are shown. References detailing some of the major results obtained in more than 10 years of the INPE radar operation are cited. Author

N84-26022# European Space Agency, Paris (France).
IMAGING BY ACTIVE LASER METHODS
Friedrich Malota Jul. 1983 52 p refs Transl. into ENGLISH of "Abbildung durch aktive laserverfahren" rept. DFVLR-FB-82-21 DFVLR, Oberpfaffenhofen, West Germany, Apr. 1982 Original language N83-21332
(ESA-TT-804; DFVLR-FB-82-21) Avail: NTIS HC A04/MF A01; original report available from DFVLR, Cologne DM 21,20

A scaner system, operated with piezo crystals, which deflects radiation from a CO2 laser is described. The radiation is continuous or in the form of pulses; in the latter case, an additional electronic device is needed. The objects examined by means of the deflection system were mainly spheres and wires, and the results are shown in picture form. Author

N84-26023# Westinghouse Research and Development Center, Pittsburgh, Pa.
A PARAMETRIC STUDY OF SURFACE TRANSFORMATION HARDENING WITH HIGH-POWER LASERS
G. E. Grotke, G. J. Bruck, J. E. Smith, and J. I. Nurminen 2 Feb. 1984 117 p
(Contract N00014-82-C-2339)
(AD-A140160; Rept-84-9D4-SURFC-R1) Avail: NTIS HC A06/MF A01 CSCL 20/5

High-power, continuous-wave CO2 lasers were employed in a parametric study of penetration, cross-sectional area, and hardness in nine steels that provided a wide range in composition, carbon content, hardenability, and response to heat treatment. The test conditions included laser output powers from 5.0 to 12.5 KW and travel speeds in the range 20 to 100 ipm which, with the beam sizes used, resulted in energy densities from 0.52 to 7.01 KJ/sq cm. Laser transformation hardening treatment resulted in appreciable hardness in all the steels that had adequate carbon content and good hardenability. The maximum and average hardness produced in these steels corresponds to martensite contents of 90 to 100 per cent. Author (GRA)

N84-26024# New Mexico Univ., Albuquerque.
INVESTIGATIONS OF VACUUM ULTRAVIOLET AND SOFT X-RAY LASERS Final Report, 15 May 1982 - 14 May 1983
A. Elci Mar. 1984 71 p
(Grant AF-AFOSR-0128-81; AF Proj. 2301)
(AD-A140362; AFOSR-84-0254TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

The regimes in which an X-ray free electron laser can be operated are discussed. One possible use of an X-ray laser to nuclear spectroscopy is described. Intense field effects on nuclear beta decay are analyzed. Author (GRA)

N84-26025# Naval Weapons Center, China Lake, Calif.
LASER INDUCED DAMAGE IN OPTICAL MATERIALS: 1982 Final Report
Harold E. Bennett, Arthur H. Guenther (AFWL), David Milam (California Univ., Livermore, Lawrence Livermore Lab.), and Brian E. Newnam (Los Alamos National Lab.) Jan. 1984 502 p refs Proc. of the 14th Ann. Symp. on Optical Mater. for High Power Lasers, Boulder, Colo., 16-17 Nov. 1982; sponsored by the American Society for Testing and Materials, ONR, DOE and DARPA
(PB84-175124; NBS-SP-669; LC-83-600625) Avail: NTIS HC A22/MF A01 CSCL 20E

The emphasis was directed toward new frontiers and new developments. Particular emphasis was given to materials for high power apparatus. The wavelength range of prime interest was from 10.6 micrograms to the UV region. Highlights included surface characterization, thin film-substrate boundaries, and advances in fundamental laser-matter threshold interactions and damage mechanisms. GRA

N84-26026# New Mexico Univ., Albuquerque.
NUMERICAL SIMULATION OF A THREE-DIMENSIONAL CHEMICAL LASER FLOW FIELD INCLUDING RADIATION PRODUCED BY LASER INDUCED FLUORESCENCE Ph.D. Thesis
Dennis William Lankford 1983 270 p
Avail: Univ. Microfilms Order No. DA8404437

Chemical lasers typically derive power from the reaction of two gas streams inside a laser cavity. Operation at optimal laser efficiency requires detailed understanding and control of a number of energy transfer processes. The requirement to minimize collisional deactivation in chemical lasers has resulted in mixing the cavity gases supersonically. Mixing of the gases at typical cavity conditions is predominantly by molecular diffusion and is quite slow compared to the gas velocity. Enhancing mixing of the gas streams has more than doubled the power from diffusion limited chemical lasers. This enhanced mixing was obtained by perturbing the laser cavity flow field by injecting jet streams into the flowing gases. A detailed understanding of this enhanced mixing process should lead to optimal laser design. Work reported in this dissertation has produced a time-dependent three-dimensional numerical solution of the Navier-Stokes equations capable of analyzing laser cavity flows with enhanced mixing due to injection jets, i.e. trip jets. Also developed was a numerical model of a new laser flow visualization technique, laser induced fluorescence (LIF). Dissert. Abstr.

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-26027*# Cleveland State Univ., Ohio.
DYNAMICS OF EARLY PLANETARY GEAR TRAINS Final Report
R. August, R. Kasuba, J. L. Frater, and A. Pintz Washington NASA Jun. 1984 233 p refs
(Grant NAG3-186)
(NASA-CR-3793; NAS 1.26:3793) Avail: NTIS HC A11/MF A01 CSCL 13I

A method to analyze the static and dynamic loads in a planetary gear train was developed. A variable-variable mesh stiffness (VVMS) model was used to simulate the external and internal spur gear mesh behavior, and an equivalent conventional gear train concept was adapted for the dynamic studies. The analysis can be applied either involute or noninvolute spur gearing. By utilizing the equivalent gear train concept, the developed method may be extended for use for all types of epicyclic gearing. The method is incorporated into a computer program so that the static and dynamic behavior of individual components can be examined. Items considered in the analysis are: (1) static and dynamic load sharing among the planets; (2) floating or fixed Sun gear; (3) actual tooth geometry, including errors and modifications; (4) positioning errors of the planet gears; (5) torque variations due to noninvolute gear action. A mathematical model comprised of power source, load, and planetary transmission is used to determine the instantaneous loads to which the components are subjected. It considers fluctuating output torque, elastic behavior in the system, and loss of contact between gear teeth. The dynamic model has nine degrees of freedom resulting in a set of simultaneous second order differential equations with time varying coefficients, which are solved numerically. The computer program was used to determine the effect of manufacturing errors, damping and component stiffness, and transmitted load on dynamic behavior. It is indicated that this methodology offers the designer/analyst a comprehensive tool with which planetary drives may be quickly and effectively evaluated. E.A.K.

N84-26028# National Aerospace Lab., Tokyo (Japan).
EFFECT OF OUTER RACE MISALIGNMENT ON THE HIGH SPEED PERFORMANCE OF BALL BEARINGS
Katsumi Seki Nov. 1983 33 p refs In JAPANESE; ENGLISH summary
(NAL-TR-786; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

For rolling bearings to operate at peak performance, it is necessary to mount the inner and outer races accurately against the axis of rotation. However, because of the lack of required precision of the housing and the axis, the misalignment of bearings, etc., bearings are sometimes used with the inner and outer race tilted. Misalignment of rolling bearings greatly affect their high speed performance such as bearing friction and bearing life. Experiments were conducted to determine the allowable limiting dn values and the running performance of deep-grove ball bearings (type 6220) operating at dn values ranging from .000005 to .0000025 under a thrust load of 1,000 kgf. Bearing frictional torque, bearing temperature rise and contact electric resistance were measured at various tilt angles of outer race with respect to inner race. Author

N84-26029*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FACTORS THAT AFFECT THE FATIGUE STRENGTH OF POWER TRANSMISSION SHAFTING
Stuart H. Loewenthal 1984 28 p refs Proposed for presentation at the 4th Intern. Power Transmission and Gearing Conf., Cambridge, Mass., 8-12 Oct. 1984; sponsored by ASME
(NASA-TM-83608; E-1984; NAS 1.15:83608) Avail: NTIS HC A03/MF A01 CSCL 13I

A long standing objective in the design of power transmission shafting is to eliminate excess shaft material without compromising operational reliability. A shaft design method is presented which accounts for variable amplitude loading histories and their influence on limited life designs. The effects of combined bending and torsional loading are considered along with a number of application factors known to influence the fatigue strength of shafting materials. Among the factors examined are surface condition, size, stress concentration, residual stress and corrosion fatigue. Author

N84-26030# Research Inst. of National Defence, Stockholm (Sweden).
ATTEMPT TO STUDY BY OCULAR INSPECTION THE INFLUENCE OF RUBBER QUALITY ON THE SEALING EFFECTS OF O-RINGS
Boerje Roejdaas Dec. 1983 25 p In SWEDISH; ENGLISH summary
(FOA-C-20526-E4; ISSN-0347-3694) Avail: NTIS HC A02/MF A01

A device which makes it possible to study the elastoflowing and the sealing effects of rubber seals especially O-rings during assembling and the time after is described. The device is also used to check and compare seals against a standard. Autho

N84-26031# New Hampshire Univ., Durham.
A PROPORTIONAL PIEZOELECTRIC ELECTROPNEUMATIC SERVOVALVE DESIGN
B. M. Herrick Mar. 1984 110 p
(Contract DAAK21-79-C-0117)
(AD-A140224; HDL-CR-83-117-1) Avail: NTIS HC A06/MF A01 CSCL 13/11

This report deals with the development of a new proportional electropneumatic servovalve. The first stage of the valve consists of a piezoelectric bender element of bimorph construction centered between two nozzles. The bimorph acts as a flapper and is deformed by an electrical input signal. This deformation causes a pressure difference to be generated downstream of the nozzles. This pressure difference is then amplified to some usable level using laminar proportional amplifiers. An equivalent mathematical model for the behavior of the valve system is developed and verified. The model is then used to select a bimorph and a laminar proportional amplifier gain block. After the system parameters have been selected using the model, a working prototype is then constructed and tested. The validity of the design equations is shown by the correlation with experimental results, and an improved design is suggested. Author (GRA)

N84-26032# Air Products and Chemicals, Inc., Allentown, Pa.
SOLID STATE COMPRESSOR Status Report, 1 Oct. - 31 Dec. 1983
W. A. Steyert 20 Jan. 1984 20 p
(Contract N00014-83-C-0394; DARPA Order 4746)
(AD-A140498; SR-2) Avail: NTIS HC A02/MF A01 CSCL 13/7

The overall goal of this program is to develop a gas compressor which uses modern piezoelectric or electrostrictive materials in place of a magnetic type motor. These materials can exert very large forces, but have only a limited travel. The key to the successful implementation of this compressor concept is a motion amplifier which will be studied at APCI in a one cell simulator. Prior to building the simulator which will be used primarily to study material properties, we have analyzed the elastomer requirements. The motion amplifier is an elastomer which is squeezed between two plates. The elastomer is basically incompressible; therefore, as the plates move together the elastomer will extrude from around the edges. It is necessary to understand the mechanics of the elastomer motion in order to design the motion amplifier and, thus, the compressor. GRA

N84-26033# Naval Ship Research and Development Center, Bethesda, Md.
RUBBER TO BACKING BOND STRENGTH FOR STAVE BEARINGS
T. L. Daugherty Apr. 1984 53 p
(AD-A140513; DTNSRDC-84/009) Avail: NTIS HC A04/MF A01 CSCL 13/8

Rubber-surfaced stave bearings in most U.S. Navy ships support the propulsion shafting and propeller aft of the main shaft seal. Problems have been encountered with inadequate bonding of the rubber surface to their brass backing and with corrosion of the brass backing. The objective of this work was twofold: to develop improved specification criteria that would ensure reliable bonding between the rubber surface and the backing, and to evaluate the bond strength of alternative backing materials that eliminate corrosion. The results probably reflect properties of the rubber used because most specimens of the plastic-backed design failed by tearing within the rubber rather than by adhesion at the interface. The rubber surface is softer than that specified for the Class 1 stave bearing. Despite the strength reductions observed after being subjected to the environmental conditions, the plastic-backed staves met the present specification limits. Both hard rubber and plastic appear to be adequate materials to meet the adhesive bond strength requirements of the specification. Recommended changes to the military specification with rationale for each change are preferred for both brass-backed and nonmetal-backed bearing staves. GRA

N84-26440 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Drehfluegler und Verkehr.
A PRINCIPAL ROTOR WITHOUT JOINTS AND PILLOWS, MADE OF FIBER MATERIALS, FOR DYNAMIC SYSTEMS OF FUTURE HELICOPTERS [GELENK- UND LAGERLOSER HAUPTROTROR IN FASERVERBUNDBAUWEISE FUER DYNAMISCHE SYSTEME ZUKUENFTIGER HUBSCHRAUBER]
M. Huber *In its* Tech. and Sci. Publ. 1983 1983 p 159-187 refs In GERMAN Presented at 3rd Bundesmin. fuer Forsch. u. Technol. (BMFT)-Statusseminar: Luftfahrtforsch. u. Luftfahrttechnol., Hamburg, 2-4 May 1983 (For primary document see N84-26430 16-81)
(MBB-UD-384-83-O) Avail: Issuing Activity

N84-26441 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
A REAR ENGINE WITHOUT JOINTS AND PILLOWS [GELENK- UND LAGERLOSES HECKROTORSYSTEM IN FASERVERBUND-BAUWEISE]
H. Frommlet *In its* Tech. and Sci. Publ. 1983 1983 p 189-219 refs In GERMAN Presented at 3rd Bundesmin. fuer Fosch. u. Technol. (BMFT)-Statusseminar: Luftfahrtforsch. u. Luftfahrt-technol., Hamburg, 2-4 May 1983 Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N84-26430 16-81)
(MBB-UD-383-83-O) Avail: Issuing Activity

N84-26450 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
NC-CONTROLLED MACHINE WITH A CABLE [NC-GESTEUERTE KABELVERLEGEMASCHINE]
Juergen Maskow and Peter Marr *In its* Tech. and Sci. Publ. 1983 1983 p 329-333 ref In GERMAN (For primary document see N84-26430 16-81)
(MBB-UT-21-83-O) Avail: Issuing Activity

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-26034# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
BASIC REQUIREMENTS FOR PRODUCT ASSURANCE OF ESA SPACECRAFT AND ASSOCIATED EQUIPMENT
May 1981 43 p
(ESA-PSS-01-0-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The ESA product assurance specification system is outlined. It defines the basic requirements for all product assurance disciplines involved in the work performed under development contracts for ESA spacecraft and associated equipment. E.A.K.

N84-26035# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assuarance Div.
PRODUCT ASSURANCE MANAGEMENT AND AUDIT SYSTEMS FOR ESA SPACECRAFT AND ASSOCIATED EQUIPMENT
May 1981 37 p
(ESA-PSS-01-10-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

Product assurance (PA) requirements that are associated with, and complementary to, every other PA discipline are outlined. They cover program management, planning and auditing, the use of standard practices and configuration management. E.A.K.

N84-26036# European Space Research and Technology Center, Noordwijk (Netherlands).
QUALITY ASSURANCE OF ESA SPACECRAFT AND ASSOCIATED EQUIPMENT
Apr. 1981 60 p

(ESA-PSS-01-20-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The quality assurance requirements of European Space Agency spacecraft and associated equipment are established. Process control, procurement, and materials handling are among the topics discussed. R.J.E.

N84-26037# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

SOFTWARE QUALITY ASSURANCE FOR ESA SPACECRAFT AND ASSOCIATED EQUIPMENT

Feb. 1983 19 p

(ESA-PSS-01-21-Issue-1; ISSN-0379-4059) Avail: NTIS HC A02/MF A01

This specification establishes the software quality assurance requirements for ESA spacecraft and associated equipment. Software procurement and development, configuration management, and nonconformance control are discussed. R.J.F.

N84-26038# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

RELIABILITY ASSURANCE OF ESA SPACECRAFT

May 1981 21 p

(ESA-PSS-01-30-Issue-1; ISSN-0379-4059) Avail: NTIS HC A02/MF A01

The European Space Agency (ESA) reliability assurance requirements to be applied by contractors and subcontractors to ESA spacecraft and associated equipment are established. The reliability assurance requirements are implemented on ESA space programs in order to define and possibly measure the risk probability of achieving a successful mission. R.J.F.

N84-26039# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

SAFETY ASSURANCE OF ESA SPACECRAFT AND ASSOCIATED EQUIPMENT

Apr. 1981 31 p refs

(ESA-PSS-01-40-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The requirements for safety assurance of ESA unmanned spacecraft and associated equipment are defined. It does not cover all requirements of the respective launcher authorities or national safety regulations. E.A.K.

N84-26040# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

MATERIAL AND PROCESS SELECTION AND QUALITY CONTROL FOR ESA SPACECRAFT AND ASSOCIATED EQUIPMENT

Jun. 1983 26 p

(ESA-PSS-01-70-Issue-2; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The requirements for a material and process selection and control program for spacecraft and associated equipment are specified the use of controlled materials and processes is mandatory in spacecraft and onboard equipment. E.A.K.

N84-26041# European Space Research and Technology Center, Noordwijk (Netherlands). Mathematical Support Div.

SOFTWARE QUALITY ASSURANCE PLANS

Feb. 1983 18 p

(ESA-PSS-01-101-Issue-1; ISSN-0379-4059) Avail: NTIS HC A02/MF A01

Uniform, acceptable requirements for the preparation and content of software quality assurance plans is specified. The specifications are based on the IEEE Standard for Quality Assurance Plans. E.A.K.

N84-26042# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

QUALITY ASSURANCE OF TEST HOUSES FOR ESA SPACECRAFT AND ASSOCIATED EQUIPMENT

Aug. 1983 27 p refs

(ESA-PSS-01-203-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The minimum quality assurance (QA) requirements for test houses are specified. The houses supply environmental testing service to ensure that such activities preserve the test item integrity, and the validity of the test. E.A.K.

N84-26043# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

A THERMAL VACUUM ISSUE FOR THE SCREENING OF SPACE MATERIALS

Mar. 1983 28 p

(ESA-PSS-01-702-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

A thermal vacuum test to determine the outgassing properties of materials is described. The materials are proposed for use in the fabrication of ESA spacecraft and associated equipment and for optical devices. E.A.K.

N84-26044# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

A THERMAL CYCLING TEST FOR THE SCREENING OF SPACE MATERIALS AND PROCESSES

Aug. 1982 24 p

(ESA-PSS-01-704-Issue-1; ISSN-0379-4059) Avail: NTIS HC A02/MF A01

A thermal cycling test under vacuum for the screening of materials and processes intended for use in the fabrication of ESA spacecraft and associated equipment is outlined. The test determines the ability of these articles to withstand extreme changes of ambient temperature under vacuum. E.A.K.

N84-26045# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Quality Control Dept.

NONDESTRUCTIVE TESTING OF COMPOSITE STRUCTURES

M. Chiquillo, B. Gagnage, and M. Torres 1983 11 p Presented at the AAAF 8th European Rotorcraft and Powered Life Aircraft Forum, Aix-en-Provence, France, 31 Aug. - 3 Sep. 1982

(SNIAS-832-210-108) Avail: NTIS HC A02/MF A01

The use of composite materials in helicopter construction is growing rapidly. With composite parts, the composite material and the final aircraft are obtained simultaneously during the curing process. Manufacturing defects may appear not only at the junction areas but also at the core of the composites. The purpose of non-destructive tests is to detect such defects and thus determine the conformity of the parts. Nondestructive tests appropriate for the examination of composite parts are reviewed, and the general principle of each method along with some examples of application are given. Among the tests reviewed are: sonic inspection, ultrasonic flow detection, X-ray inspection, holographic interferometry, stiffness measurement, acoustic emission, and stroboscopic inspection. R.S.F.

N84-26046# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

THE LISTING AND APPROVAL PROCEDURE FOR MATERIALS AND PROCESSES

Oct. 1982 37 p

(ESA-PSS-01-716-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

The documentation requirements relevant to obtaining ESA approval for the use of materials and processes in the fabrication of spacecraft and associated equipment are outlined. E.A.K.

N84-26047# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.

THE CONTROL OF LIMITED LIFE MATERIALS

Dec. 1982 17 p

(ESA-PSS-01-722-Issue-1; ISSN-0379-4059) Avail: NTIS HC A02/MF A01

The procedure used for the control of limited life materials which are employed in the fabrication of ESA spacecraft and associated equipment are defined. E.A.K.

N84-26048# Aeronautical Research Labs., Melbourne (Australia).
NERF: A COMPUTER PROGRAM FOR THE NUMERICAL EVALUATION OF RELIABILITY FUNCTIONS-RELIABILITY MODELING, NUMERICAL METHODS AND PROGRAM DOCUMENTATION
G. D. MAllinson and A. D. Graham 1983 622 p refs
(AR-00-984; ARL-Struc-397) Avail: NTIS HC A99/MF A01

A computer program is described which was designed to evaluate reliability functions derived by Payne and others that result from the application of reliability analysis to the fatigue of aircraft structures. The development of the reliability functions evaluated by the NERF program is elaborated. A.R.H.

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N84-26049 Catholic Univ. of America, Washington, D.C.
UNIFIED ANALYTICAL KINEMATIC ANALYSIS AND SYNTHESIS OF SPATIAL MECHANISMS Ph.D. Thesis
Ho-Kwon Kim 1983 241 p
Avail: Univ. Microfilms Order No. DA8401474

A method of displacement analysis using direction cosine matrices is presented and applied to various four bar spatial linkages. The mathematics involved are elementary; the operations are simple without loss of geometric interpretation, and the solutions are exact. Using this special property of the direction cosine matrix, that is, that each element of the matrix equals its own cofactor, exact analytical solutions without resorting to numerical or iterative schemes are obtained. The purpose of this type of synthesis is to design a 1-degree-of-freedom spatial mechanism which produces the specified function in the output link for the given range of input link such that $y = f(x)$. The governing synthesis equation of the mechanism to design is derived by using the direction cosine matrix method. The derivation of this governing equation involves highly complex algebraic equations which include all the design mechanism's dimensional parameters. Dissert. Abstr.

N84-26050 Washington Univ., Seattle.
CIRCUMFERENTIAL CRACKS IN CYLINDRICAL SHELLS Ph.D. Thesis
Robert William Nicholson 1983 221 p
Avail: Univ. Microfilms Order No. DA8402180

Fracture mechanics methodology is developed for investigating axisymmetric part through cracks in stiffened and unstiffened cylindrical shells. The principle behind the method is coupling equations which describe the behavior of the shell and the crack zone, using basic principles of engineering mechanics. In the linear elastic regime, model 1 and model 2 stress intensity formulae are derived for several loading conditions. The condition of fully developed plasticity in the remaining ligament is studied by slip field analysis. Appropriate slip fields are derived which are valid for all permissible combinations of axial load and bending moment, the accuracy of these fields being checked by use of nondimensional interaction diagrams. Stability of the cracks after the onset of crack growth is investigated by the tearing modulus approach. An assessment of the principal sources of error is performed. Dissert. Abstr.

N84-26051 Istituto di Ricerche Breda S.p.A., Milan (Italy).
CREEP-LOW CYCLE FATIGUE INTERACTION OF 2 1/4 Cr 1 Mo STEEL AT HIGH TEMPERATURE
V. Mandorini, R. Cusolito, and C. Tribuno 1982 13 p refs In ITALIAN; ENGLISH summary Presented at 10th Conv. Nazl. dell'Assoc. Ital. per l'Anal. delle Sollecitazioni, Cosenza, Italy, 22-25 Sep. 1982
Avail: Issuing Activity

The creep-low cycle fatigue interaction of 2 1/4 chromium 1 molybdenum steel at high temperature is not adequately described by the cumulative damage Palmgren-Miner Rule. A more complex model, based on the strain-range partitioning method, was used as the basis for further investigation of the creep-fatigue interaction in chromium steel. Test methodologies and results are shown. R.S.F.

N84-26052# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
A MODIFIED MODAL METHOD FOR NONLINEAR DYNAMIC ANALYSIS OF STRUCTURES Ph.D. Thesis
Norman Francis Knight, Jr. 6 May 1984 307 p refs
Avail: NTIS HC A14/MF A01

A computational procedure is presented for predicting the dynamic response of curved beams, plates and shells with geometric nonlinearities and subjected to a step loading. The mathematical formulation is based on a modified form of the Hellinger-Reissner mixed variational principle. The temporal integration is performed by using an explicit half-station central difference scheme which results in a linear system of algebraic equations. Thus, the cost of a nonlinear dynamic analysis is directly proportional to the total number of degrees of freedom in the discrete structural model. Author

N84-26053*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF PREFORMING ADHERENDS ON STATIC AND FATIGUE STRENGTH OF BONDED COMPOSITE SINGLE-LAP JOINTS
James Wayne Sawyer Jun. 1984 17 p refs
(NASA-TP-2324; L-15780; NAS 1.60:2324) Avail: NTIS HC A02/MF A01 CSCL 20K

An analytical and experimental investigation was conducted on bonded composite single-lap joints with the adherends performed to reduce the angle between the line of action of the applied in-plane force and the bondline. A classical closed-form solution was used to analyze the composite joints with various preform angles and overlap lengths. The adherends of the test specimens were preformed before bonding, during the layup and curing process. Static tests were conducted for preform angles of 0, 5, 10, and 15 deg and overlap lengths of 0.75, 1.75, 2.75, and 3.75 in. A limited fatigue study was conducted for specimens with a 2.75-in. overlap and a preform angle of 5 deg. Results of the analysis showed that preforming the adherends of bonded composite single-lap joints significantly reduced the shear and peel stress concentrations in the adhesive. Experimental results showed that preforming the adherends significantly increased their static and fatigue strength and thus increased the load level for which bonded composite single-lap joints can be designed. Author

N84-26054*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STATISTICAL CORRELATION OF STRUCTURAL MODE SHAPES FROM TEST MEASUREMENTS AND NASTRAN ANALYTICAL VALUES
L. Purves, R. Strang, M. P. Dube, P. Alea, N. Ferragut, and D. Hershfeld Nov. 1983 122 p refs
(NASA-TM-86044; NAS 1.15:86044) Avail: NTIS HC A06/MF A01 CSCL 20K

The software and procedures of a system of programs used to generate a report of the statistical correlation between NASTRAN modal analysis results and physical tests results from modal surveys are described. Topics discussed include: a mathematical description of statistical correlation, a user's guide for generating a statistical correlation report, a programmer's guide describing the organization and functions of individual programs leading to a statistical correlation report, and a set of examples including complete listings of programs, and input and output data. E.A.K.

N84-26055# National Aerospace Lab., Tokyo (Japan).
CREEP DEFORMATION MEASUREMENT OF POLYMER STRIPS AFTER BUCKLING BY MOIRE METHOD

Shinichi Koshide Nov. 1983 12 p refs In JAPANESE; ENGLISH summary
(NAL-TR-789; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Creep deflection measurements for polymer strips by the Moire method are described. The mechanical properties of polymer are normally dependent on temperature and time. The out of plane deformation of the materials, such as deflection caused by buckling, also are greatly affected by temperature and time. Especially, in the range above the glass transition temperature of the materials the stiffness decrease and the deformation shows considerable viscoelastic behavior. Deflection analysis with Moire method is carried out by the following process. The reference gratings are projected on the reference surface and the specimen surface subjected to deformation, then the gratings on those surfaces are recorded on film. Moire fringe patterns are observed by inserting the film into an optical spatial filtering system. The fringe patterns are formed by differences in pitch of the gratings which depend on out of plane deformation of the specimens. The deflections are analyzed from the fringe patterns. Author

N84-26056# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
AN INDUCTIVE PROCESS IN AUTOMATIC RECORDING OF CRACK PROPAGATION Final Report [EIN INDUKTIVES VERFAHREN ZUR AUTOMATISCH EN EFGASSUNG DES RISSFORTSCHRITTS.]
John H. Argyris, Werner Aicher, Juergen Ertelt, and Frank Hailer Sep. 1982 45 p refs In GERMAN
(Contract DFG-AR-44/42)
(ISD-298; ISSN-0170-6071) Avail: NTIS HC A03/MF A01

An automatic registering procedure was developed to examine crack propagation of metal sheets. The accuracy of the process is shown by visual imagery through an adjustable microscope. A control electronic system was developed, which registers fast advancing crack initiation and unstable crack propagation. The automatic registering procedure is applied to parametric investigations of crack propagation in metal sheets under operational analogous forces. Transl. by E.A.K.

N84-26057# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
REVIEW OF AERONAUTICAL FATIGUE INVESTIGATIONS IN THE NETHERLANDS DURING THE PERIOD MARCH 1981 - FEBRUARY 1983
J. B. deJonge, ed. Mar. 1983 45 p refs Presented at 18th ICAF Conf., Toulouse, 30-31 May 1983
(AD-B082166; NLR-MP-83016-U) Avail: NTIS HC A03/MF A01

A brief review is given of work performed in the Netherlands in the field of aeronautical fatigue. Where possible, applicable references are presented. Flight simulation testing procedures, crack propagation studies, fatigue of joints, fatigue of composite materials, and nondestructive inspection and repair procedures are discussed. R.J.F.

N84-26058# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.
THE SARIB VIBRATION ABSORBER
Pierre Hege and Gerard Genoux 1983 13 p Presented at the AAAF 9th European Rotorcraft and Powered Lift Aircraft Forum, Stresa, Italy, 13-15 Sep. 1983
(SNIAS-832-210-104) Avail: NTIS HC A02/MF A01

The SARIB I and II vibration absorbing systems were tested. The major vibration absorber systems under study or installed on Aerospatiale's and other various world manufacturers' aircraft are reviewed and the results of the flight tests performed on the SARIB I and II vibration absorbers as mounted on the AS 350 Ecureuil are presented. It is shown that the reduction in vibration level is quite significant and also weight saving. E.A.K.

N84-26059# Ballistic Research Labs., Aberdeen Proving Ground, Md.
REVISIONS TO THE PETROS 4 SHELL RESPONSE CODE Final Report
N. J. Huffington, Jr. and H. L. Wisniewski Feb. 1984 93 p
(DA Proj. 1L1-61102-AH-43)
(AD-A140268; AD-F300408; ARBRL-TR-02550-Rev) Avail: NTIS HC A05/MF A01 CSCL 01/2

The existing PETROS 4 finite deflection elastoplastic structural shell response code was modified to permit analysis of the response of structural panels to nearby high explosive detonations. A modified constitutive formulation involving prescribed through-thickness stresses was introduced. Previously omitted surface traction terms were added to the equations of motion. A recycling option based on a strain equivalence criterion was introduced to inhibit the unrestricted growth of a breathing mode. Additional printer and plotter output features were incorporated into the program. GRA

N84-26060# SRI International Corp., Menlo Park, Calif.
DYNAMIC FRACTURE BEHAVIOR OF STRUCTURAL MATERIALS Annual Report, Feb. 1983 - Feb. 1984
D. A. Shockey and J. H. Giovanola Mar. 1984 17 p
(Contract F49620-81-K-0007; AF Proj. 2306)
(AD-A140381; AFOSR-84-0262TR; AR-3) Avail: NTIS HC A02/MF A01 CSCL 11/6

Structures used by the U.S. Air Force must be designed to resist catastrophic fracture when subjected to dynamic loads. For example, aircraft components may experience short stress pulses from airborne debris, military projectiles, or intense bursts of laser or X-ray radiation. Landing gear and aircraft retaining cables on carrier ships experience dynamic loads at the end of each flight. A related dynamic fracture problem concerns rapidly running cracks. For example, it is often desirable to know whether a crack, once initiated, will arrest before it reaches a component boundary and thereby preserve the integrity of the structure. Thus, to ensure safe design of Air Force structures, it is necessary to have a knowledge of the dynamic fracture behavior of the component materials. The research being conducted in this program is aimed at improving our understanding of dynamic fracture. Emphasis is on the accurate characterization of material resistance to crack initiation under dynamic loading (K sub Id measurements) and to rapid crack propagation (K sub Id measurements). This annual report reviews the specific program objectives and summarizes the progress during the third research year. GRA

N84-26061# Ballistic Research Labs., Aberdeen Proving Ground, Md.
BOUNDARY CONDITION AND STRAIN-RATE EFFECTS ON THE RESPONSE OF BLAST-LOADED BEAMS Final Report
N. J. Huffington, Jr. and J. D. Wortman Mar. 1984 51 p
(DA Proj. 1L1-61102-AH-43)
(AD-A140428; AD-F300405; ARBRL-TR-02551) Avail: NTIS HC A04/MF A01 CSCL 19/4

New interpretations to the results from previously reported air blast-loaded beam tests are derived, based on computations using a modified finite difference large amplitude elastoplastic beam response code which now includes a new strain-rate dependent constitutive model plus associated dynamic material data and revisions to better simulate the physical support conditions, including frictional and rotatory inertia effects. GRA

N84-26062# Ohio State Univ., Columbus.
AN INTERPRETIVE STUDY OF PLATE AND SHELL BUCKLING Final Report, 15 Feb. 1980 - 15 Jun. 1983
A. W. Leissa 10 Jun. 1983 11 p
(Contract N00014-80-K-0281)
(AD-A140487) Avail: NTIS HC A02/MF A01 CSCL 20/11

The objective of the proposed research was to search the literature and locate all information relevant to plate and shell buckling; to collect the relevant journal articles, books, reports, theses, conference proceeding papers; to digest, summarize, organize and integrate the useful knowledge found and to make interpretative assessments; to determine problems where further research is needed; to produce a typed manuscript and ink drawings suitable for publishing a set of monographs; to clarify and unify the fields of plate and shell buckling. GRA

N84-26063# Naval Postgraduate School, Monterey, Calif.
NON-LINEAR TRANSIENT RESPONSE OF FLAT PLATE TO AIR SHOCK WAVE M.S. Thesis
J. N. Lee Dec. 1983 121 p
(AD-A140491) Avail: NTIS HC A06/MF A01 CSCL 19/4

The non-linear elasto-plastic response of a clamped flat plate to a typical air shock wave were investigated. The nonlinear effects to the plate responses due to the material and geometric nonlinearity were studied. In this study, (1) the necessity of the modification of old armored vehicles was reviewed and (2) the NASTRAN code was employed in this investigation, (3) the theoretical background of the nonlinear transient analysis was described, (4) a step by step procedure of analyzing the dynamic load problem by shock wave using NASTRAN code was developed, and (5) sensitivity analyses were performed and also difficulties associated and the nonlinear analysis were described.
Author (GRA)

N84-26064# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
STRESS INTENSITY FACTORS FOR SLIGHTLY KINKED, PARTIALLY CLOSED CRACKS IN COMPRESSION
N. Aravas and R. M. McMeeking Apr. 1984 33 p
(Contract N00014-81-K-0650)
(AD-A140550) Avail: NTIS HC A03/MF A01 CSCL 20/11

A solution is presented for the elastic stress intensity factors at the tips of a slightly kinked, partially closed crack in compression. The solution is accurate to first order in the deviation of the crack surface from a straight line and is carried out using perturbation procedures analogous to those of Banichuk, Goldstein and Salganik, and Cotterell and Rice for the problem of an open crack. Comparison with the exact solution indicates that the asymptotic solution is accurate for values of the angle between the straight crack and its out-of-plane kinks up to about 20. Author (GRA)

N84-26065# Northeastern Univ., Boston, Mass.
THEORY OF EXTERIOR AND HARMONIC EIGENSTRAINS Ph.D. Thesis
Ronald Richard Castles 1983 167 p
Avail: Univ. Microfilms Order No. DA8403394

A general expression is found for the stress and displacement field both inside and outside an ellipsoid when the eigenstrain is defined outside the ellipsoid and zero inside. The body containing the ellipsoid is anisotropic, three dimensional, and infinitely extended. Constant, polynomial, and inverse power eigenstrains are discussed as examples. The elastic field, when the ellipsoid is flat, is also determined. The elastic field throughout a three dimensional, infinitely extended, anisotropic body containing an ellipsoidal inclusion omega is found when the eigenstrain is a harmonic function inside omega. The elastic fields are also determined when the harmonic eigenstrain is given outside omega. Using these results, the fields are calculated for a dilatational eigenstrain defined on the surface of omega, and the harmonic eigenstrains are defined in the first case, inside, and in the second case, outside omega. Specific numerical examples are presented. Also, using this analysis, both the internal and external elastic field due to a Somigliana dislocation is found. Dissert. Abstr.

N84-26066# Oklahoma Univ., Norman.
DEFLECTION AND VIBRATION IN SHEAR-DEFORMABLE BEAMS AND LIMINATED COMPOSITES MADE OF BIMODULAR AND MULTIMODULAR MATERIALS Ph.D. Thesis
Faramarz Gordaninejad 1983 164 p
Avail: Univ. Microfilms Order No. DA8404565

A transfer matrix analysis is presented for determining the static and dynamic behavior of thick, orthotropic beams of multimodular materials (i.e., materials which have different elastic behavior in tension and compression with nonlinear stress strain curve approximated as piecewise linear; with four or more segments). Also, an exact solution is presented for cases in which the neutral surface location is constant along the beam axis. Results for axial displacement; transverse deflection, bending slope, frequency, bending moment, transverse shear force, axial force, and location of neutral surface are presented for different load and boundary conditions. In addition, comparisons are made among multimodular, bimodular, and unimodular models for a beam with aramidcord-rubber properties taken from experimental stress-strain curves. Dissert. Abstr.

N84-26067# Wisconsin Univ., Madison.
DYNAMIC RESPONSE OF ROTATING BEAMS WITH NONCONSTANT ANGULAR VELOCITY Ph.D. Thesis
Daniel Charles Kammer 1983 222 p
Avail: Univ. Microfilms Order No. DA8321758

The effects of a nonconstant angular velocity upon the vibration of a rotating beam are examined. The angular velocity is written as the sum of a steady value and a small periodic perturbation. The time dependence of the angular velocity results in the appearances of terms in the equations of motion which cause the system to be nonautonomous. The configuration studied consists of a beam mounted on the periphery of a rigid rotating body, and inclined at an arbitrary angle of tilt with respect to the spin axis. Two specific orientations, a radially mounted beam and a beam mounted parallel to the spin axis, are considered in the analysis. A perturbation technique, called the KBM method, is used to derive approximate solutions and the expressions for the boundaries between stable and unstable motion. In certain configurations, the beam experiences compressive axial loads due to the rotation. Therefore, the beam buckles if the angular velocity is sufficiently large. Dissert. Abstr.

N84-25807# Fraunhofer Inst. fuer Werkstoffmechanik, Freiburg (West Germany).
ON SOME CURRENT PROBLEMS IN EXPERIMENTAL FRACTURE DYNAMICS
J. F. Kalthoff *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 11-35 (For primary document see N84-25806 16-26)
(AD-P003102) Avail: NTIS HC A11/MF A01 CSCL 11/6

N84-25813# California Inst. of Tech., Pasadena.
PROCESSES CONTROLLING THE DYNAMIC FRACTURE OF BRITTLE SOLIDS
K. Ravi-Chandar and W. G. Knauss *In its* Workshop on Dyn. Oct. 1983 p 119-129 (For primary document see N84-25806 16-26)
(AD-P003108) Avail: NTIS HC A11/MF A01 CSCL 20/11

N84-25818# Hibbitt, Karlsson and Sorensen, Providence, R.I.
DYNAMIC KINKING AND BIFURCATION OF CRACKS IN PLANE STRAIN
P. Burgers *In* Calif. Inst. Technol. Workshop on Dyn. Oct. 1983 p 178-186 (For primary document see N84-25806 16-26)
(AD-P003113) Avail: NTIS HC A11/MF A01 CSCL 11/2

N84-25874# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Structures Dept.
DEVELOPMENTS IN STRUCTURAL VIBRATION TESTING METHODS
R. Dat *In its* La Rech. Aerospatiale, Bimonthly Bull., No. 1983-6, 217/Nov.-Dec. Apr. 1984 p 41-56 refs (For primary document see N84-25870 16-31)
Avail: NTIS HC A04/MF A01; HC available at ONERA, Paris FF 55; original report in FRENCH available at ONERA, Paris FF 60

N84-25875# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
A NONLINEAR MODEL OF LAMINATED PLATE, USING COMBINED VARIABLES
Th. Nevers and R. Girard *In its* La Rech. Aerospatiale, Bimonthly Bull., No. 1983-6, 217/Nov.-Dec. Apr. 1984 p 57-59 refs (For primary document see N84-25870 16-31)
Avail: NTIS HC A04/MF A01; HC available at ONERA, Paris FF 55; original report in FRENCH available at ONERA, Paris FF 60

N84-26431 Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
ON IMPROVING THE FATIGUE PERFORMANCE OF A DOUBLE-SHEAR LAP JOINT
L. Schwarmann *In* MBB Tech. and Sci. Publ. 1983 1983 p 9-17 refs (For primary document see N84-26430 16-81)
(VFW-29/83-O) Avail: Issuing Activity

42 GEOSCIENCES (GENERAL)

N84-26068*# National Aeronautics and Space Administration, Washington, D. C.
MICROANALYTICAL STUDY OF SOME COSMIC DUST DISCOVERED IN SEA-FLOOR SEDIMENTS IN CHINA
Zhuang Shijie, Peng Hanchang (Beijing inst. of Petroleum Exploration and Development, China), and Yu Zhong (China Bureau of Oceanography) Mar. 1984 17 p refs Transl. into ENGLISH from Acta Mineral. Sinica (China), Mar. 1983 p 9-14 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Ministry of Metallurgical Industry
(Contract NASw-3542)
(NASA-TM-77409; NAS 1.15:77409) Avail: NTIS HC A02/MF A01 CSCL 08G

The study of cosmic dust can provide useful data in the investigation of the origin of the Earth and the evolution of celestial bodies. Three types of cosmic dust (ferriginous, siliceous, and glassy) were discovered in the seafloor sediments near China. Their chemical composition and microstructure were examined by X-ray diffraction, fractography, and electron microscopy. The major mineral in an iron-containing cosmic dust is magnetite. The silicate spheres contain sundry metals and metal oxides. Glassy microtektites are similar in composition to tektites, and are found in all the major meteorite areas worldwide. R.S.F.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-26069 Bayerische Akademie der Wissenschaften, Munich (West Germany). Working Group III/1 of ISP
SEMINAR ON MATHEMATICAL MODELS OF GEODETIC/PHOTOGRAMMETRIC POINT DETERMINATION WITH REGARD TO OUTLIERS AND SYSTEMATIC ERRORS
Friedrich E. Ackermann, ed. 1983 130 p refs Seminar held at Stuttgart, 26-27 Nov. 1981
(Ser-A-98; ISBN-3-7696-81800; ISSN-0065-5369) Copyright. Avail: Issuing Activity

The achievements of practical procedures for geodesy and photogrammetric point determination rely on the consistent application of the least squares method. With the increased automation of computations and raised levels of precision the modelling of outliers and of systematic errors present problems with regard to the assessment of such errors and the quality control of results. Recent developments in photogrammetric point determination by analytical phototriangulation are described. For individual titles, see N84-26070 through N84-26078.

N84-26070 Stuttgart Univ. (West Germany). Inst. for Photogrammetry.
MATHEMATICAL MODELS OF PHOTOGRAMMETRIC POINT DETERMINATION
Friedrich E. Ackermann *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 7-22 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

The development of mathematical models for photogrammetric point determination has evolved in combination with its practical application, its computational methods, and its accuracy performance. The refinement of the models did not generally originate from an overall theoretical concept but evolved step by step from inconsistencies and deficiencies of the practical models used, particularly in connection with the continuously increasing precision performance. The step by step development of mathematical models for photo triangulation is retraced in order to show how photogrammetry has reached the stage where now a general and comprehensive theory is required. This approach was chosen deliberately for introductory and background purposes. The available theoretical tools are deployed and the general concepts of mathematical modelling are displayed. It will then be possible, hopefully, to design tests in order to provide the parameters which are essential for a comprehensive model. Author

N84-26071 Cologne Univ. (West Germany). Inst. of Mathmatics
ROBUST STATISTICAL METHODS **c64**
F. Goetze *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 23-28 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

Robust statistical methods serve as a safeguard against gross errors and are relatively insensitive to departure from the underlying normal model. The prospects and limitations of these methods for adjustment of observations are briefly sketched. Author

N84-26072 Stuttgart Univ. (West Germany). Inst. of Geodetics.
STOCHASTIC MODELS FOR POINT MANIFOLDS
E. Grafarend *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 29-52 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

With respect to a methodological comparison of geodetic and photogrammetric methods stochastic models for point manifolds are reviewed. At first nonlinear observational equations of photogrammetry and terrestrial/satellite geodesy are discussed with respect to first order and higher order models. Model disturbances are represented by polynomial series. Stochastic point manifolds like the point distribution in a photogram are analyzed by means of the Taylor-Karman structure for a homogeneous and isotropic random process in two and three dimensions. First order Markov processes in two and three dimensional Euclidean space characterize the characteristic functions of the Taylor-Karman structure. In detail the linearization process of a set of nonlinear observational equations under a priori information is described. Author

N84-26073 Bonn Univ. (West Germany). Inst. for Theoretical Geodetics.
ESTIMATION OF VARIANCES AND COVARIANCES IN THE MULTIVARIATE AND IN THE INCOMPLETE MULTIVARIATE MODEL
K. R. Koch *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 53-59 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

Systematic errors are caused by introducing too few parameters in the model for the estimation of unknown parameters. If the missing parameters are random variables with the expectation zero, they are taken into account by the variances and covariances of the observations. Full covariance matrices are therefore generally needed in the model for the estimation of parameters. In the multivariate model the variance and the covariances of measurements repeated during different epochs are estimated, while the univariate formulation of the multivariate model with unknown variance and covariance components allows the estimation of the weight matrix of the observations of one epoch. The estimation of the variances and the covariances of the repeated measure-

ments and of the weight matrix of the observations of one epoch is also discussed in the incomplete multivariate model which has to be used for the estimation of the parameters of a photogrammetric aerotriangulation. Author

N84-26074 Technische Univ., Hanover (West Germany). Inst. of Geodetics.
DETECTION OF ERRORS IN THE FUNCTIONAL ADJUSTMENT MODEL
Hans Pelzer *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 61-70 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

Among the error sources of geodetic measuring techniques the most feared are those which have an equal or similar effect on different measured variables, e.g. zero errors of distance measuring equipment. If such errors remain undetected and are disregarded in both the functional and stochastic part of an adjustment model, (systematic measuring deviations or model disturbances) their effects on the adjustment result are discussed. Author

N84-26075 Karlsruhe Univ. (West Germany). Inst. of Geodetics.
PROBLEMS OF COMPUTING COSTS IN DECISION PROBLEMS c65
J. vanMierlo *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 71-78 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

Error detection procedures were extensively developed during the past 15 years. A detection procedure has to be designed to locate and estimate the model error(s) in the observation(s) by computational methods. Statistical decision theory is applied in actual geodetic or photogrammetric practice. To obtain a clearer line of thought in testing theory, the statistical decision theory is very helpful. The decision theory is concerned with the problem of making decisions under uncertainty, uncertainty due to randomness and about the law of randomness. A justified choice of values is made possible by applying the decision theory approach. The costs of measurement and remeasurement and the costs of the consequences of non-detected errors must be evaluated, so that the economic choice of the parameters is investigated. For this, the probabilistic model of the occurence of errors must be estimated. This model only is determined if the information of all detected errors occuring in practical networks becomes available. Author

N84-26076 Stuttgart Univ. (West Germany). Inst. for Photogrammetry.
RELIABILITY AND DISCERNABILITY OF EXTENDED GAUSS-MARKOV MODELS c65
W. Foerstner *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 79-104 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

The reliability of estimated parameters is described by the sensitivity of detecting errors in the mathematical model and by the influence of nondetectable model errors on the parameters. The reliability theory of Baarda is extended in two directions: (1) the alternative hypothesis depends on a parameter vector. This leads to reliability measures which depend on the direction of the parameter vector. (2) The ability to distinguish two alternative hypotheses is described by the probability of choosing a wrong alternative. This error of III type at the same time serves for an evaluation of a nonstochastic correlation coefficient. Author

N84-26077 International Inst. for Aerial Survey and Earth Sciences, Enschede (Netherlands).
SEVERAL ASPECTS OF THE SEQUENTIAL PROCESSING OF PHOTOGRAMMETRIC BUNDLE BLOCKS
M. Molenaar *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 105-130 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

An adjustment procedure for photogrammetric bundle blocks is presented, based on the algorithm of Tienstra's standard problem I. The method is designed so that an adjustment in steps is possible, which implies that the adjustment runs parallel to (on-line with) the measuring process of bundle blocks. The computing process is split up into two stages: first, the formation of strips by means of sequential relative orientations and triplet formations, and second, the connection of strips to ground control and other data. Condition equations are formulated for the observations in both stages. Testing procedures are then formulated for the detection of gross errors in the input data in each stage and a strategy is given for choosing optimal critical values for the tests. Finally, the possibilities of handling systematic block deformations are discussed, which leads to a modification of either the functional model or the stochastic model for the observations. Author

N84-26078 Aalborg Univ. (Denmark). Lab. for Photogrammetry.
THE DANISH METHOD: EXPERIENCE AND PHILOSOPHY c64
T. Krarup and K. Kubik *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 131-134 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

Some experience is given with the application of the Danish estimation method, which forms a valuable alternative to the method of least squares, especially in the presence of outlayers. The Danish method is interpreted as an iterative method (penalty method) for solving nonlinear programming problems if the weights for outliers are iteratively reduced to zero. Author

N84-26079 Bayerische Akademie der Wissenschaften, Munich (West Germany).
CORRELATION CALCULATION IN STEREOSCOPIC IMAGE PAIRS FOR THE AUTOMATIC ACQUISITION OF DIGITAL LAND MODELS, ORTHOPICTURES AND HEIGHT LINE PLANES Ph.D. Thesis - Karlsruhe Univ. [KORRELATIONSRECHNUNG IN STEREOBILDPAAREN ZUR AUTOMATISCHEN GEWINNUNG VON DIGITALEN GELAENDEMODELLEN ORTHOPHOTOS UND HOEHENLINIENPLAENEN]
Michael Claus 1983 97 p refs In GERMAN
(Ser-C283; ISBN-3-7696-9334-5; ISSN-0065-5325) Copyright.
Avail: Issuing Activity

Photogrammetric plotting which is based on the averaging of the difference of X-image coordinates of homologous points in both images of a stereo imagery is discussed. The orthophotograph is a geometric map, however, provides more information. The graphic design of a stereo image pair in analog or analytic is still very useful. The stresses of automatic locations of homologous points by analog or digital correlations of the density value of the points and their environment in both images is outlined. The automatic calculations to which the cartographic processing and data displays are matched are examined. Transl. by E.A.K.

N84-26080 Bayerische Akademie der Wissenschaften, Munich (West Germany).
FISHEYE OBJECTIVE IN THE DOSE RANGE PHOTOGRAMMETRY: THEORETICAL AND PRACTICAL INVESTIGATIONS Ph.D. Thesis - Technische Univ. [FISHEYE-OBJEKTIVE IN DER NAHBEREICHSPHOTOGRAMMETRIE: THEORETISCHE UND PRAKTISCHE UNTERSUCHUNGEN]
Hans-Joachim Hellmeier 1983 72 p refs In GERMAN
(Ser-C-286; ISBN-3-7696-9336-1; ISSN-0065-5325) Copyright.
Avail: Issuing Activity

The nontopographic application of photogrammetry with the use of fisheye objective display was investigated. The use of fisheye objectives is only practical when used with numerical methods. The individual spot determinations are examined. A linear plotting

system with the use of an analytical plotter which extended the control program does not cause difficulties. Problems which are caused by the linear initiative of a stereo model because of nonperspectiveness of the imagery and large numerical differences are indicated. Transl. by E.A.K.

N84-26081*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
IRRIGATED RICE AREA ESTIMATION USING REMOTE SENSING TECHNIQUES: PROJECT'S PROPOSAL AND PRELIMINARY RESULTS
Nelson de Jesus Parada, Principal Investigator, Getulio Vargas deAssuncao, Mauricio Alves Moreira, and Rene Antonio Novaes May 1984 10 p Submitted for publication Sponsored by NASA ERTS
(E84-10131; NASA-CR-172806; NAS 1.26:172806;
INPE-3105-PRE/504) Avail: NTIS HC A02/MF A01 CSCL 02C

The development of a methodology for annual estimates of irrigated rice crop in the State of Rio Grande do Sul, Brazil, using remote sensing techniques is proposed. The project involves interpretation, digital analysis, and sampling techniques of LANDSAT imagery. Results are discussed from a preliminary phase for identifying and evaluating irrigated rice crop areas in four counties of the State, for the crop year 1982/1983. This first phase involved just visual interpretation techniques of MSS/LANDSAT images. Author

N84-26082*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
LANDSAT-4 IMAGE DATA QUALITY ANALYSIS Quarterly Progress Report, 10 Nov. 1983 - 9 Feb. 1984
P. E. Anuta 9 Feb. 1984 4 p ERTS
(Contract NAS5-26859)
(E84-10134; NASA-CR-172507; NAS 1.26:172507;
LARS-CR-020984) Avail: NTIS HC A02/MF A01 CSCL 05B

Classification performance from LANDSAT 4 TM and MSS data is evaluated using the SECHO computer program. The data accuracy is compared using forest, corn, soybeans, bare soil, grass, water, and urban areas as classes for investigation. M.A.C.

N84-26083*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PRINCIPAL COMPONENTS TECHNIQUE ANALYSIS FOR VEGETATION AND LAND USE DISCRIMINATION
Nelson de Jesus Parada, Principal Investigator, Antonio Roberto Formaggio, Joao Roberto dosSantos, and Luiz Alberto Vieira Dias Apr. 1984 12 p refs Submitted for publication Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E84-10135; NASA-CR-172808; NAS 1.26:172808;
INPE-3077-PRE/490) Avail: NTIS HC A02/MF A01 CSCL 02F

Automatic pre-processing technique called Principal Components (PRINCO) in analyzing LANDSAT digitized data, for land use and vegetation cover, on the Brazilian cerrados was evaluated. The chosen pilot area, 223/67 of MSS/LANDSAT 3, was classified on a GE Image-100 System, through a maximum-likehood algorithm (MAXVER). The same procedure was applied to the PRINCO treated image. PRINCO consists of a linear transformation performed on the original bands, in order to eliminate the information redundancy of the LANDSAT channels. After PRINCO only two channels were used thus reducing computer effort. The original channels and the PRINCO channels grey levels for the five identified classes (grassland, 'cerrado', burned areas, anthropic areas, and gallery forest) were obtained through the MAXVER algorithm. This algorithm also presented the average performance for both cases. In order to evaluate the results, the Jeffreys-Matusita distance (JM-distance) between classes was computed. The classification matrix, obtained through MAXVER, after a PRINCO pre-processing, showed approximately the same average performance in the classes separability. Author

N84-26084*# Arizona Univ., Tucson. Optical Sciences Center.
SPECTRORADIOMETRIC CALIBRATION OF THE THEMATIC MAPPER AND MULTISPECTRAL SCANNER SYSTEM Quarterly Report, 1 Feb. - 1 May 1984
James M. Palmer, Principal Investigator and Philip N. Slater 1 May 1984 24 p refs ERTS
(Contract NAS5-27382)
(E84-10136; NASA-CR-172809; NAS 1.26:172809; QR-6) Avail: NTIS HC A02/MF A01 CSCL 14B

The newly built Caste spectropolarimeters gave satisfactory performance during tests in the solar radiometer and helicopter modes. A bandwidth normalization technique based on analysis of the moments of the spectral responsivity curves was used to analyze the spectral bands of the MSS and TM subsystems of LANDSAT 4 and 5 satellites. Results include the effective wavelength, the bandpass, the wavelength limits, and the normalized responsivity for each spectral channel. Temperature coefficients for TM PF channel 6 were also derived. The moments normalization method used yields sensor parameters whose derivation is independent of source characteristics (i.e., incident solar spectral irradiance, atmospheric transmittance, or ground reflectance). The errors expected using these parameters are lower than those expected using other normalization methods. A.R.H.

N84-26085*# California Univ., Berkeley. Space Sciences Lab.
ANALYSIS OF THE QUALITY OF IMAGE DATA ACQUIRED BY THE LANDSAT-4 THEMATIC MAPPER AND MULTISPECTRAL SCANNERS Quarterly Status Technical Progress Report, 1 Jan. - 31 Mar. 1984
Robert N. Colwell, Principal Investigator 15 Apr. 1984 22 p ERTS
(Contract NAS5-27377)
(E84-10137; NASA-CR-172810; NAS 1.26:172810; QSTPR-5) Avail: NTIS HC A02/MF A01 CSCL 05B

The geometric quality of TM film and digital products is evaluated by making selective photomeasurements and by measuring the coordinates of known features on both the TM products and map products. These paired observations are related using a standard linear least squares regression approach. Using regression equations and coefficients developed from 225 (TM film product) and 20 (TM digital product) control points, map coordinates of test points are predicted. The residual error vectors and analysis of variance (ANOVA) were performed on the east and north residual using nine image segments (blocks) as treatments. Based on the root mean square error of the 223 (TM film product) and 22 (TM digital product) test points, users of TM data expect the planimetric accuracy of mapped points to be within 91 meters and within 117 meters for the film products, and to be within 12 meters and within 14 meters for the digital products. M.A.C.

N84-26086*# Georgia Univ., Athens. Dept. of Geography.
COMPARATIVE ASSESSMENT OF LANDSAT-D MSS AND TM DATA QUALITY FOR MAPPING APPLICATIONS IN THE SOUTHEAST Report, 15 Oct. 1983 - 15 Jul. 1984
6 Jun. 1984 3 p ERTS
(Contract NAS5-27383)
(E84-10138; NASA-CR-172811; NAS 1.26:172811) Avail: NTIS HC A02/MF A01 CSCL 05B

Rectifications of multispectral scanner and thematic mapper data sets for full and subscene areas, analyses of planimetric errors, assessments of the number and distribution of ground control points required to minimize errors, and factors contributing to error residual are examined. Other investigations include the generation of three dimensional terrain models and the effects of spatial resolution on digital classification accuracies. M.A.C.

N84-26087*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SAMPLING SYSTEM FOR WHEAT (TRITICUM AESTIVUM L) AREA ESTIMATION USING DIGITAL LANDSAT MSS DATA AND AERIAL PHOTOGRAPHS
Nelson de Jesus Parada, Principal Investigator, Mauricio A. Moreira,

Sherry C. Chen, and Getulio T. Batista Apr. 1984 13 p refs Submitted for publication Sponsored by NASA ERTS
(E84-10139; NASA-CR-172812; NAS 1.26:172812;
INPE-3076-PRE/489) Avail: NTIS HC A02/MF A01 CSCL 02C

A procedure to estimate wheat (Triticum aestivum L) area using sampling technique based on aerial photographs and digital LANDSAT MSS data is developed. Aerial photographs covering 720 square km are visually analyzed. To estimate wheat area, a regression approach is applied using different sample sizes and various sampling units. As the size of sampling unit decreased, the percentage of sampled area required to obtain similar estimation performance also decreased. The lowest percentage of the area sampled for wheat estimation with relatively high precision and accuracy through regression estimation is 13.90% using 10 square km as the sampling unit. Wheat area estimation using only aerial photographs is less precise and accurate than those obtained by regression estimation. M.A.C.

N84-26088*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EVALUATION OF SOLAR ANGLE VARIATION OVER DIGITAL PROCESSING OF LANDSAT IMAGERY
Nelson de Jesus Parada, Principal Investigator and Evlyn M. L. M. Novo May 1984 10 p refs Submitted for publication Sponsored by NASA ERTS
(E84-10140; NASA-CR-172813; NAS 1.26:172813;
INPE-3101-PRE/500) Avail: NTIS HC A02/MF A01 CSCL 05B

The effects of the seasonal variation of illumination over digital processing of LANDSAT images are evaluated. Original images are transformed by means of digital filtering to enhance their spatial features. The resulting images are used to obtain an unsupervised classification of relief units. After defining relief classes, which are supposed to be spectrally different, topographic variables (declivity, altitude, relief range and slope length) are used to identify the true relief units existing on the ground. The samples are also clustered by means of an unsupervised classification option. The results obtained for each LANDSAT overpass are compared. Digital processing is highly affected by illumination geometry. There is no correspondence between relief units as defined by spectral features and those resulting from topographic features. M.A.C.

N84-26089*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EVALUATION OF ENTROPY AND JM-DISTANCE CRITERIONS AS FEATURES SELECTION METHODS USING SPECTRAL AND SPATIAL FEATURES DERIVED FROM LANDSAT IMAGES
Nelson de Jesus Parada, Principal Investigator, Luciano V. Dutra, F. A. Mitsuo Ii, and Nelson D. A. Mascarenhas May 1984 10 p refs Presented at the Intern. Soc. for Photogrammetry and Remote Sensing Congr., Rio de Janeiro, 18-29 Jun. 1984 Sponsored by NASA ERTS
(E84-10141; NASA-CR-172814; NAS 1.26:172814;
INPE-3122-PRE/515) Avail: NTIS HC A02/MF A01 CSCL 12A

A study area near Ribeirao Preto in Sao Paulo state was selected, with predominance in sugar cane. Eight features were extracted from the 4 original bands of LANDSAT image, using low-pass and high-pass filtering to obtain spatial features. There were 5 training sites in order to acquire the necessary parameters. Two groups of four channels were selected from 12 channels using JM-distance and entropy criterions. The number of selected channels was defined by physical restrictions of the image analyzer and computacional costs. The evaluation was performed by extracting the confusion matrix for training and tests areas, with a maximum likelihood classifier, and by defining performance indexes based on those matrixes for each group of channels. Results show that in spatial features and supervised classification, the entropy criterion is better in the sense that allows a more accurate and generalized definition of class signature. On the other hand, JM-distance criterion strongly reduces the misclassification within training areas. Author

N84-26090*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
APPLICATION OF LANDSAT DATA TO THE STUDY OF URBAN DEVELOPMENT IN BRASILIA [APLICACOES DE DADOS DOS SATELITES LANDSAT NO ESTUDO DA EVOLUCAO URBANA DE BRASILIA]
Nelson de Jesus Parada, Principal Investigator, Maria de Lourdes Neves deOliveira, Celina Foresti, Madalena Niero, and Elza Maria de Morais Franco Parreiras Apr. 1984 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 1st Congr. Brasil. de Defesa do Meio Ambiente, 2-6 Jul. 1984 Sponsored by NASA ERTS
(E84-10142; NASA-CR-172815; NAS 1.26:172815;
INPE-3063-PRE/480) Avail: NTIS HC A02/MF A01 CSCL 08B

The urban growth of Brasilia within the last ten years is analyzed with special emphasis on the utilization of remote sensing orbital data and automatic image processing. The urban spatial structure and the monitoring of its temporal changes were examined in a whole and dynamic way by the utilization of MSS-LANDSAT images for June (1973, 1978 and 1983). In order to aid data interpretation, a registration algorithm implemented in the Interactive Multispectral Image Analysis System (IMAGE-100) was utilized aiming at the overlap of multitemporal images. The utilization of suitable digital filters, combined with the images overlap, allowed a rapid identification of areas of possible urban growth and oriented the field work. The results obtained in this work permitted an evaluation of the urban growth of Brasilia, taking as reference the proposal stated for the construction of the city in the Pilot Plan elaborated by Lucio Costa. M.G.

N84-26091*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AN INTEGRATED SOFTWARE SYSTEM FOR GEOMETRIC CORRECTION OF LANDSAT MSS IMAGERY
Nelson de Jesus Parada, Principal Investigator, Antonio Jose Ferreira M. eSilva, Fernando Augusto Mitsuo Ii, Gilberto Camara-Neto, Paulo Roberto Martins Serra, and Ricardo Cartaxo Modesto deSousa Apr. 1984 12 p refs Presented at the 15th Intern. Congr. of Photogrammetry and Remote Sensing, Rio de Janeiro, 17-20 Jun. 1984 Sponsored by NASA ERTS
(E84-10143; NASA-CR-172816; NAS 1.26:172816;
INPE-3078-PRE/491) Avail: NTIS HC A02/MF A01 CSCL 09B

A system for geometrically correcting LANDSAT MSS imagery includes all phases of processing, from receiving a raw computer compatible tape (CCT) to the generation of a corrected CCT (or UTM mosaic). The system comprises modules for: (1) control of the processing flow; (2) calculation of satellite ephemeris and attitude parameters, (3) generation of uncorrected files from raw CCT data; (4) creation, management and maintenance of a ground control point library; (5) determination of the image correction equations, using attitude and ephemeris parameters and existing ground control points; (6) generation of corrected LANDSAT file, using the equations determined beforehand; (7) union of LANDSAT scenes to produce and UTM mosaic; and (8) generation of output tape, in super-structure format. A.R.H.

N84-26092*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FOREST INVENTORY USING MULTISTAGE SAMPLING WITH PROBABILITY PROPORTIONAL TO SIZE
Nelson de Jesus Parada, Principal Investigator, David C. L. Lee, Pedro HernandezFilho, Yosio E. Shimabukuro, Oswaldo R. deAssis, and Jose Simeao deMedeiros Apr. 1984 10 p refs Presented at the Intern. Soc. of Photogrammetry and Remote Sensing Congr., Rio de Janeiro, 18-29 Jun. 1984 Sponsored by NASA ERTS
(E84-10144; NASA-CR-172817; NAS 1.26:172817;
INPE-3084-PRE/494) Avail: NTIS HC A02/MF A01 CSCL 02F

A multistage sampling technique, with probability proportional to size, for forest volume inventory using remote sensing data is developed and evaluated. The study area is located in the Southeastern Brazil. The LANDSAT 4 digital data of the study area are used in the first stage for automatic classification of reforested areas. Four classes of pine and eucalypt with different

tree volumes are classified utilizing a maximum likelihood classification algorithm. Color infrared aerial photographs are utilized in the second stage of sampling. In the third state (ground level) the time volume of each class is determined. The total time volume of each class is expanded through a statistical procedure taking into account all the three stages of sampling. This procedure results in an accurate time volume estimate with a smaller number of aerial photographs and reduced time in field work. M.A.C.

N84-26093*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

MULTISEASONAL VARIABLES IN DIGITAL IMAGE ENHANCEMENTS FOR GEOLOGICAL APPLICATIONS

Nelson de Jesus Parada, Principal Investigator, Icaro Vitorello, and Raimundo AlmeidaFilho Apr. 1984 13 p refs Presented at the Intern. Symp. on Photogrammetry and Remote Sensing Congr., Rio de Janeiro, 17-29 Jun. 1984 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(E84-10145; NASA-CR-173235; NAS 1.26:173235; INPE-3100-PRE/499) Avail: NTIS HC A02/MF A01 CSCL 08G

Examples of enhanced multiseasonal orbital imagery illustrate the influence of multiseasonal changes in their spatial and spectral attributes, and consequently in their application to structural geology and lithological discrimination. Shadow effects associated with appropriate solar elevation and azimuth effects enhance the spatial attributes but not the spectral. In this case, variations in illumination conditions should be minimized by selecting images with high solar elevation and by the use of techniques that minimize illumination conditions. Multiseasonal imagery should be used in the identification of spectral contrast changes of rock-soil-vegetation associations which can provide evidences of related lithological units and structural features. The extraction of maximum geological information requires, at least, a fall/winter and a spring/summer scene from which spatial, spectral and multiseasonal attributes can be adequately explored. A.R.H.

N84-26094*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

FIELD DATA OBSERVED DURING THE GEOLOGICAL EXCURSION IN THE WEST-CENTRAL REGION OF THE SUL-RIOGRANDE SHIELD [DADOS DE CAMPO OBSERVADOS NO CAMINHAMENTO GEOLOGICO REALIZADO NA REGIAO CENTRO-OESTE DO ESCUDO SUL-RIOGRANDENSE]

Nelson de Jesus Parada, Principal Investigator and Tomoyuki Ohara May 1984 230 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS

(E84-10146; NASA-CR-173236; NAS 1.26:173236; INPE-3098-NTE/218) Avail: NTIS HC A11/MF A01 CSCL 08G

Outcrops are studied in the Copper Project test area of the Rio Grande do Sul State of Brazil. The accuracy of LANDSAT-MSS data is checked against field data. A preliminary geological map is included on a scale of 1:500,000 that describes 820 outcrop over an area of 1,700 kilometers. M.A.C.

N84-26095*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE USE OF AN IMAGE REGISTRATION TECHNIQUE IN THE URBAN GROWTH MONITORING

Nelson de Jesus Parada, Principal Investigator, Celina Foresti, Maria de Lourdes N. deOliveira, Madalena Niero, and Elza Maria de Morais F. Parreira (Companhia do Desenvolvimento do Planalto Central) Apr. 1984 7 p refs Presented at the 15th Intern. Soc. of Photogrammetry and Remote Sensing Congr., Rio de Janeiro, 18-29 Jun. 1984 Submitted for publication Sponsored by NASA ERTS

(E84-10147; NASA-CR-173237; NAS 1.26:173237; INPE-3089-PRE/496) Avail: NTIS HC A02/MF A01 CSCL 08B

The use of an image registration program in the studies of urban growth is described. This program permits a quick identification of growing areas with the overlap of the same scene in different periods, and with the use of adequate filters. The city of Brasilia, Brazil, is selected for the test area. The dynamics of Brasilia urban growth are analyzed with the overlap of scenes dated June 1973, 1978 and 1983. The results showed the utilization of the image registration technique for the monitoring of dynamic urban growth. M.A.C.

N84-26096*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

EVALUATION OF SIR-A (SHUTTLE IMAGING RADAR) IMAGES FROM THE TRES MARIAS REGION (MINAS GERAIS STATE, BRAZIL) USING DERIVED SPATIAL FEATURES AND REGISTRATION WITH MSS-LANDSAT IMAGES

Nelson de Jesus Parada, Principal Investigator, Hermann J. H. Kux, and Luciano Vieira Dutra May 1984 8 p refs Presented at the Intern. Soc. for Photogrammetry and Remote Sensing Congr., Rio de Janeiro, 18-29 Jun. 1984 Sponsored by NASA ERTS

(E84-10148; NASA-CR-173238; NAS 1.26:173238; INPE-3113-PRE/510) Avail: NTIS HC A02/MF A01 CSCL 05B

Two image processing experiments are described using a MSS-LANDSAT scene from the Tres Marias region and a shuttle Imaging Radar SIR-A image digitized by a vidicon scanner. In the first experiment the study area is analyzed using the original and preprocessed SIR-A image data. The following thematic classes are obtained: (1) water, (2) dense savanna vegetation, (3) sparse savanna vegetation, (4) reforestation areas and (5) bare soil areas. In the second experiment, the SIR-A image was registered together with MSS-LANDSAT bands five, six, and seven. The same five classes mentioned above are obtained. These results are compared with those obtained using solely MSS-LANDSAT data. The spatial information as well as coregistered SIR-A and MSS-LANDSAT data can increase the separability between classes, as compared to the use of raw SIR-A data solely. M.A.C.

N84-26097*# California Univ., Davis. Dept. of Electrical and Computer Engineering.

LANDSAT-D THEMATIC MAPPER IMAGE DIMENSIONALITY REDUCTION AND GEOMETRIC CORRECTION ACCURACY Quarterly Status Technical Progress Report, 3 Dec. 1983 - 3 Mar. 1984

Gary E. Ford, Principal Investigator 3 Mar. 1984 7 p refs ERTS

(Contract NAS5-27577)

(E84-10149; NASA-CR-173239; NAS 1.26:173239) Avail: NTIS HC A02/MF A01 CSCL 08B

Principal components transformations was applied to a Walnut Creek, Texas subscene to reduce the dimensionality of the multispectral sensor data. This transformation was also applied to a LANDSAT 3 MSS subscene of the same area acquired in a different season and year. Results of both procedures are tabulated and allow for comparisons between TM and MSS data. The TM correlation matrix shows that visible bands 1 to 3 exhibit a high degree of correlation in the range 0.92 to 0.96. Correlation for bands 5 to 7 is 0.93. Band 4 is not highly correlated with any other band, with corrections in the range 0.13 to 0.52. The thermal band (6) is not highly correlated with other bands in the range 0.13 to 0.46. The MSS correlation matrix shows that bands 4 and 5 are highly correlated (0.96) as are bands 6 and 7 with a correlation of 0.92. A.R.H.

N84-26098*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

UNDERSTANDING AND UTILIZATION OF THEMATIC MAPPER AND OTHER REMOTELY SENSED DATA FOR VEGETATION MONITORING Final Report, 1 Nov. 1982 - 31 Oct. 1983

E. P. Crist, R. C. Cicone, M. D. Metzler, T. M. Parris, D. P. Rice, and R. E. Sampson Nov. 1983 102 p refs ERTS

(Contract NAS9-16538)

(E84-10150; NASA-CR-171781; NAS 1.26:171781; ERIM-160300-76-F) Avail: NTIS HC A06/MF A01 CSCL 08B

The TM Tasseled Cap transformation, which provides both a 50% reduction in data volume with little or no loss of important information and spectral features with direct physical association,

is presented and discussed. Using both simulated and actual TM data, some important characteristics of vegetation and soils in this feature space are described, as are the effects of solar elevation angle and atmospheric haze. A preliminary spectral haze diagnostic feature, based on only simulated data, is also examined. The characteristics of the TM thermal band are discussed, as is a demonstration of the use of TM data in energy balance studies. Some characteristics of AVHRR data are described, as are the sensitivities to scene content of several LANDSAT-MSS preprocessing techniques. A.R.H.

N84-26099*# Texas A&M Univ., College Station. Dept. of Statistics.
AREA ESTIMATION USING MULTIYEAR DESIGNS AND PARTIAL CROP IDENTIFICATION Final Report
Robert L. Sielken, Jr. May 1984 50 p refs ERTS
(Contract NAS9-16785)
(E84-10151; NASA-CR-171785; NAS 1.26:171785) Avail: NTIS HC A03/MF A01 CSCL 02C

Statistical procedures were developed for large area assessments using both satellite and conventional data. Crop acreages, other ground cover indices, and measures of change were the principal characteristics of interest. These characteristics are capable of being estimated from samples collected possibly from several sources at varying times, with different levels of identification. Multiyear analysis techniques were extended to include partially identified samples; the best current year sampling design corresponding to a given sampling history was determined; weights reflecting the precision or confidence in each observation were identified and utilized, and the variation in estimates incorporating partially identified samples were quantified. A.R.H.

N84-26100# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RESULTS OF FIELD OBSERVATIONS OF RADIO WAVES IN ALLUVIAL DEPOSITS IN CARA STATE FROM 1:100.000: FORTALEZA, CANIRDE, TAPERUABA, SANTA QUITERIA, SOBRAL, AND SAO LUIZ DO CURU [RELATORIO DO TRABALHO DE RECONHECIMENTO DE CAMPO DE AREAS ALUVIONARES NO ESTADO DO CEARA, FOLHAS 1:100.000: FORTALEZA, CANINDE, TAPERUABA, SANTA QUITERIA, SOBRAL, IRAUCUBA E SAO LUIZ DO CURU]
Marx Prestes Barbosa Apr. 1984 138 p In PORTUGUESE; ENGLISH summary Original doc. contains color illustrations
(INPE-3061-NTE/216) Avail: NTIS HC A07/MF A01

The observations of the field reconnaissance accomplished in 18th and 19th October 1983, in the regions of Fortaleza, Caninde, Taperuaba, Santa Quiteria, Sobral and Sao Luiz do Curu in Ceara State are reported. Author

N84-26101# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
METHODOLOGICAL APPROACH IN LITHOLOGICAL DISCRIMINATION BY DIGITAL PROCESSING: A CASE STUDY IN THE SERRA DO RAMALHO, STATE OF BAHIA
Icaro Vitorello and Waldir Renato Paradella May 1984 14 p refs Presented at the Intern. Soc. for Photogrammetry and Remote Sensing Congr., Rio de Janeiro, Brazil, 18-29 Jun. 1984
(INPE-3108-PRE/507) Avail: NTIS HC A02/MF A01

Problems related to lithologic mapping are discussed. Enhancement techniques and thematic classifications were combined and applied in the lithological discrimination of metasediments of the Bambui Super Group (Upper Proterozoic) in the region of Serra do Ramalho, representative of a widespread transitional environment between semi-arid and temperate conditions, in the southwest portion of the State of Bahia, Brazil. A preliminary methodological sequence is discussed in datail for imagery obtained during the dry season by LANDSAT satellite. Color composites of stretched original data, band ratioing and principal components allow lithological discrimination through grey level and tonal gradations of several metasedimentary sequences, to a degree superior to reconnaissance mapping. Unsupervised (K-Means classifier) and Supervised (Maximum Likelihood classifier) were also applied, and the spatial distribution of the limestone sequence, host to a fluorite mineralization, show satisfactory results for the purposes of this research. However, the effects of vegetation cover and of human activities mask and limit in several ways lithological discrimination in this kind of environment. Author

N84-26102# European Space Agency, Paris (France).
EARTHNET: THE STORY OF IMAGES
Norman Longdon, ed. Mar. 1984 60 p Original contains color illustrations
(ESA-BR-18; ISSN-0250-1589) Avail: NTIS HC A04/MF A01

Earthnet, the European-based program involved with the acquisition, archiving, preprocessing, and distribution of satellite remote sensing data, is discussed in terms of scope and experience with NASA satellites. Interface with the SEASAT 1 satellite, the Nimbus 7, the Heat Capacity Mapping Mission (HCMM), and LANDSAT satellites is described. The cataloging and transmission of image data at Earthnet facilities are reviewed. The ERS-1 satellite of the European Space Agency (ESA) and the Spacelab project are discussed with respect to Earthnet. R.S.F.

N84-26103# Societe d'Etudes Techniques et d'Entreprises Generales, Leplessis-Robinson (France).
COMPARATIVE STUDY OF IMAGE DATA PRODUCED BY SATELLITES WITH DIFFERENT CHARACTERISTICS Final Report [ETUDE SUR LA COMPARAISON DES DONNEES IMAGES PRODUITES PAR DES SATELLITES DE CARACTERISTIQUES DIFFEENTES]
Paris ESA Oct. 1983 82 p refs
(Contract ESA-4524/81/D-JS(SC))
(ESA-CR(P)-1867) Avail: NTIS HC A05/MF A01

The methodology for combining imagery from different satellites involves choosing a reference and, by appropriate tansformations, associating several spectral responses of a target, and then reducing these responses to conditions which permit the juxtaposition in space (geometry and resolution), in time, and from the point of view of their radiometric calibration. Procedures are reviewed using examples from oceanography, geology, and the natural milieu to demonstrate feasibility and interest combining imagery from satellite imagery. A.R.H.

N84-26104# European Space Agency, Paris (France).
DIGITAL PROCESSING OF LANDSAT DATA FOR THE PREPARATION OF A LAND USE MAP OF THE RURAL DISTRICT SURROUNDING TUEBINGEN TO A SCALE OF 1:50000
Helmut Richard Goetting Feb. 1984 92 p refs Transl. into ENGLISH of "Fernerkundung mit LANDSAT sowie die digitale verarbeitung der daten zur herstellung einer landnutzungskarte des landkreises Tuebingen im massstab 1:50000" rept. DFVLR-FB-82-30 DFVLR, Oberpfaffenhofen, West Germany, 1982 Original language document announced as N83-285620 Original contains color illustrations
(ESA-TT-816; DFVLR-FB-82-30) Avail: NTIS HC A05/MF A01; original German report available from DFVLR, Cologne DM 44,20

Based on LANDSAT satellite remote sensing data, a 1:50,000 land use map of the rural environs of Tuebingen, West Germany was produced. The interactive digital image processing system called DIBIAS was used for the image processing. The main algorithms applied were geometrical rectification to Gauss-Krueger coordinates and Maximum Likelihood classification of the image data. The results were combined with both optical and digital topographical information and compared with a conventional vegetation map. An assessment of the usefulness of thematic mapping for regional planning is given. Aspects of data acquisition and the physical foundations of remote sensing are described. The reflection properties of various terrain types, differentiated in the wavelength bands of the electromagnetic spectrum, are discussed. The LANDSAT system and its associated sensing techniques are presented. R.S.F.

N84-26105# European Space Agency, Paris (France).
THE THEORY OF EARTH OBSERVATION USING MULTIPLE-FREQUENCY RADAR

Emil Sappl Sep. 1983 58 p refs Transl. into ENGLISH of "Theorie der erdbeobachtung mit mehrfrequenzradar" rept. DFVLR-FB-82-31 DFVLR, Goettingen, West Germany, Sep. 1982 Original language document announced as N83-30856
(ESA-TT-819; DFVLR-FB-82-31) Avail: NTIS HC A04/MF A01; Original Germany report available from DFVLR, Cologne DM 22,50

The backscattering from the Earth's surface using multiple-frequency radar is described by a generalized backscattering coefficient. The measurement of this coefficient is discussed. A surface whose characteristic scattering is both homogeneous and stationary is considered and thereafter the study is extended to any type of surface. The general case includes the observation of water surfaces by means of a dual frequency radar. E.A.K.

N84-26106# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
INTEGRATION OF LANDSAT LAND COVER DATA INTO THE SAGINAW RIVER BASIN GEOGRAPHIC INFORMATION SYSTEM FOR HYDROLOGIC MODELING
H. L. McKim, S. G. Ungar, C. J. Merry, and J. F. Gauthier Feb. 1984 27 p
(AD-A140185; CRREL-SP-84-1) Avail: NTIS HC A03/MF A01 CSCL 08/6

A May 1977 LANDSAT-2 scene that covered approximately 85% of the Saginaw River Basin was classified into five land cover categories (urban, agriculture, forest, freshwater wetlands and open water) using a closest centroid classifier. The LANDSAT digital data were geometrically corrected to conform to a UTM (Universal Transverse Mercator) grid before classification. The 1.1-acre LANDSAT land cover classification data base was converted to 40-acre grid cells (six-by-six blocks of LANDSAT pixels) using an aggregation scheme and was integrated into the Detroit District's existing grid cell data base. A regression relationship between unit hydrograph parameters and the LANDSAT land cover classification was developed. The results indicated that the LANDSAT-2 land cover data were suitable for the Corps of Engineers hydrologic model. GRA

N84-26107# General Electric Co., Lanham, Md. Space Systems Div.
INTERACTIVE DIGITAL IMAGE PROCESSING FOR TERRAIN DATA EXTRACTION, PHASE 4 Final Technical Report, Sep. 1982 - Nov. 1983
H. Heydt, V. Karkhanis, and T. Wescott Nov. 1983 87 p
(Contract DAAK70-79-C-0153; DA Proj. 4A1-62707-A-855)
(AD-A140197; ETL-0348) Avail: NTIS HC A05/MF A01 CSCL 08/2

This phase of the study concentrated on refinement of vegetation extraction techniques developed in phases 1 through 3. Software was also generated for scaling and mosaicking vegetation data derived from separate adjacent scenes, as appropriate for covering a given map area. The raster format classification files were converted to polygon vector files in the Standard Interface Format. Author (GRA)

N84-26108# Army Engineer Topographic Labs., Fort Belvoir, Va.
DISCRIMINATING VEGETATION AND SOILS USING LANDSAT MSS AND THEMATIC MAPPER BANDS AND BAND RATIOS
M. B. Satterwhite Mar. 1984 14 p
(AD-A140198; ETL-R-061) Avail: NTIS HC A02/MF A01 CSCL 08/6

Characterizing arid region soils and vegetation conditions from remotely sensed imagery is often limited by the low brightness contrast between soil and vegetation and between different plant communities. The purpose of this study was to determine those LANDSAT multi-spectral scanner and Thematic Mapper bands and band ratios useful for discriminating soil and vegetation in a semiarid region. Ground level reflectance spectra, 400 to 1100 nm, were taken of 35 soil and 127 vegetation samples. The sample's mean brightness values were calculated for the four MSS bands and Thematic Mapper bands 1, 2, 3 and 4. Band:band ratios were calculated. The soils were usually brighter than the vegetation in the visible region, although some gravelled soils and some gray colored species had similar values. In the visible region, brightness values ranging from 15 to 20 separated most vegetation and soils. Many soil and vegetation surfaces had similar near infrared (NIR) brightness values. The NIR:visible band ratios discriminated most soils from the vegetation samples. The soils had NIR:visible ratios less than 2.3, gray and yellow-green colored species had ratios of 2.0 to 7.5 and green vegetation had ratios $>$ 7.5. GRA

N84-26109# Army Engineer Topographic Labs., Fort Belvoir, Va.
DEM (DIGITAL GRID-POINT ELEVATION MODELS) SYNTHESIS FROM THREE-DIMENSIONAL CARTOGRAPHIC DATA
R. Carroll and D. Edwards Mar. 1984 9 p
(AD-A140211; ETL-R-059) Avail: NTIS HC A02/MF A01 CSCL 08/2

Currently, topographic products such as contour, slope, and aspect are commonly derived from computer processing of digital grid-point elevation models (DEM). DEM's can be laboriously created by a user from an analytical plotter equipped with profiling capability. Alternatively, a user can acquire a DEM produced by an external source, but then be constrained by the production resolution or accuracy which might not be suitable for the user's application. Recently, the integration of stereoplotters with geographic information systems has resulted in limited terrain data production in X, Y, X coordinates (3-dimensional digital cartographic data). In those cases where detailed 3-dimensional data exists, building a DEM from this database can save labor and preserve user-defined resolution and accuracy criteria. In this study, previously digitized 3-dimensional terrain data are combined and converted to a 3 arc second (user-defined) cell matrix. Multiple elevation data points falling into the same cell were averaged to provide a single elevation value and those cells without an elevational value were flagged. The existing elevation data could then be displayed via stereo superposition over a photographic model established on an analytical plotter and those flagged cells could be profiled. This paper presents the method involved in building a DEM from 3-dimensional cartographic data and weighs the benefits and shortfalls of this method. GRA

N84-26110# Army Engineer Topographic Labs., Fort Belvoir, Va.
AN EXPERIMENTAL VIDEO DISC FOR MAP AND IMAGE DISPLAY
D. J. Costanzo 1984 10 p
(AD-A140215; ETL-R-063) Avail: NTIS HC A02/MF A01 CSCL 08/2

A cooperative effort between four government agencies recently resulted in the completion of an experimental video disc containing a variety of map and image products. This disc covers several areas in the United States, as well as selected locations in Korea and the Middle East. The entire process to create the disc covered one year's time. The Engineer Topographic Laboratories (ETL) is presently evaluating this disc and writing the software to control access to it via microcomputer. Copies of the video disc are available for evaluation by interested government, industrial, and academic organizations. GRA

N84-26111# Army Engineer Topographic Labs., Fort Belvoir, Va.
EFFECTS OF WEATHERING AND LICHEN COVER ON THE MIDDLE INFRARED SPECTRA OF ROCKS
J. W. Eastes Mar. 1984 11 p
(AD-A140228; ETL-R-062) Avail: NTIS HC A02/MF A01 CSCL 20/6

A program to study the spectral characteristics of geologic materials in a near natural condition has been initiated at the Engineer Topographic Laboratories. Much of the present infrared spectral data on rocks and minerals has been determined with samples carefully prepared to maximize certain spectral features and does not reflect the effects of natural processes such as weathering, contamination or lichen growth. Use of such data in the interpretation of remotely sensed imagery could be misleading. This paper reports the results of some initial studies to determine if the spectral effects of rock weathering or lichen cover in the infrared region are important in remote sensing. GRA

N84-26112# Army Engineer Topographic Labs., Fort Belvoir, Va.
CARTOGRAPHIC FEATURE EXTRACTION ON ETL'S (ENGINEER TOPOGRAPHIC LABORATORIES') DIAL (DIGITAL IMAGE ANALYSIS LABORATORY) SYSTEM
R. S. Rand Mar. 1984 9 p
(AD-A140230; ETL-R-060) Avail: NTIS HC A02/MF A01 CSCL 08/2

A number of feature extraction techniques have been developed and tested on the Digital Image Analysis Laboratory (DIAL) at ETL. These techniques include stereo matching, edge detection, texture extraction, and statistical pattern recognition on digitized aerial imagery, as well as interactive binary image cleansing (raster processing) on the derived results. Experiments have shown that each of these techniques has some limited success at performing its task, but as isolated entities, they fail to perform at a level needed in a cartographic feature extraction system. This paper discusses some of the capabilities of DIAL and concludes that a method of coordinating simple feature extraction techniques under the management of a heuristic rule-based system should be investigated. GRA

N84-26113# Defense Mapping Agency, Washington, D.C.
DEVELOPMENT OF A DIGITAL MAPPING PROGRAM AT THE DEFENSE MAPPING AGENCY Final Report
M. M. Macomber and D. P. Franklin 2 Apr. 1984 8 p Presented at the Institute for Environmental Studies Sem., the Multipurpose Cadastre: Modernizing Land Inform. Systems in North Am., 26-27 Apr. 1984, Madison, Wis.
(AD-A140329) Avail: NTIS HC A02/MF A01 CSCL 08/2

This paper discusses the development of a digital mapping program at the Defense Mapping Agency (DMA). The evolution of a conventional mapping production program from time consuming labor intensive processes into highly interactive and versatile operations is covered. Special emphasis is placed on the rationale for implementation of enhanced hardware and software technologies into the production processes. GRA

N84-26114# Environmental Research Lab., Athens, Ga.
HYDROLOGIC SIMULATION PROGRAM. FORTRAN: DEVELOPMENT, MAINTENANCE AND APPLICATION
T. O. Barnwell, Jr. and J. L. Kittle (Anderson-Nichols and Co., Inc., Palo Alto, Calif.) 1984 14 p refs
(PB84-168418; EPA-600/D-84-058) Avail: NTIS HC A02/MF A01 CSCL 08H

Nonpoint sources are significant contributors of pollutants to receiving waters and quantification of their impact is a difficult task. Evaluation of these pollutants requires a tool capable of simulating the hydrologic cycle in a river basin. The Hydrologic Simulation Program-FORTRAN (HSPF) is designed to meet this need. The development of HSPF from two perspectives-the research involved in developing its simulation algorithms and the software concepts used in implementing these algorithms are discussed. Two applications in urban hydrology and water quality assessment are discussed. Author (GRA)

N84-26115# Environmental Protection Agency, Grosse Ile, Mich. Large Lakes Research Station.
MODELING OF WATER QUALITY IN LAKE MICHIGAN AND THE EFFECT OF THE ANOMALOUS ICE COVER OF 1976 - 1977
P. W. Rodgers (De Paul Univ., Grosse Ile, Mich.) and D. K. Salisbury Mar. 1984 63 p refs
(Grants EPA-R-807412; EPA-R-805325)
(PB84-167667; EPA-600/D-84-059) Avail: NTIS HC A04/MF A01 CSCL 08H

An intensive survey of water quality parameters was conducted on Lake Michigan during 1976 and 1977. A nutrient phytoplankton model (MICH1) was developed and calibrated to data from 1976. MICH1 was then applied to data from 1977 in an attempt to simulate an observed phosphorus depletion of up to 3 microgram P/1. In order to account for this rapid phosphorus loss an implicit representation of the extreme ice cover which separated these survey years was necessary. This procedure included increasing the apparent setting rate eight fold during ice cover. A time variable total phosphorus model (TPM) was used in a hindcasting application which produced a reasonable recreation of historical phosphorus concentrations. Author (GRA)

N84-26116# Louisiana State Univ., Baton Rouge. Center for Energy Studies.
THE DEVELOPMENT OF A GEOPRESSURED ENERGY MANAGEMENT INFORMATION AND ANALYSIS SYSTEM IN SUPPORT OF RESEARCH PLANNING: THIRD YEAR Annual Report, Oct. 1982 - Sep. 1983
F. M. Wrighton and L. K. Veal Mar. 1984 66 p refs
(PB84-174481; GRI-84/0027; CES/RD-84-01) Avail: NTIS HC A04/MF A01 CSCL 08I

Geopressured and hydropressured (normally pressured) aquifers containing mobile gas in thin stringers, immobile gas, and gas in solution are known to occur in the Gulf Coast areas of Louisiana and Texas. An energy management information and analysis system to support research planning for the co-production of gas and water concept was designed and implemented. Operator cooperation, numeric and analytical simulation techniques, and an improved method of estimating relative permeability were the emphasis of research. An assessment of the co-production of gas and water illustrating the technically recoverable gas-in-place in major producing regions of the United States and an evaluation of possible gas production from a hydropressured aquifer were significant studies conducted. Relevant technical information planning was implemented for incorporation into the information system. Author (GRA)

N84-26238# Battelle Inst., Frankfurt am Main (West Germany).
FUNDAMENTALS OF SPACEBORNE REMOTE SENSING: APPLICATIONS OF LASERS, VOLUME 1
M. Endemann *In its* Appl. of Laser for Climatol. and Atmospheric Res. Oct. 1983 149 p refs (For primary document see N84-26237 16-47)
(Contract ESTEC-4868/81/NL/HP(SC))
Avail: NTIS HC A16/MF A01

N84-26261# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE USE OF SATELLITE OBSERVATIONS OF THE OCEAN SURFACE IN COMMERCIAL FISHING OPERATIONS
D. R. Montgomery *In* Naval Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 121-155 (For primary document see N84-26257 16-48)
(AD-P003120) Avail: NTIS HC A13/MF A01 CSCL 22/2

N84-26263# McQuest Marine Research and Development Co. Ltd., Burlington (Ontario).
APPLICATION OF COMPUTER IMAGE PROCESSING TO UNDERWATER SURVEYS
P. R. Paluzzi *In* Naval Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 173-188 (For primary document see N84-26257 16-48)
(AD-P003122) Avail: NTIS HC A13/MF A01 CSCL 20/6

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-26117# Department of Energy, Washington, D. C.
ENERGY TECHNOLOGY CHARACTERIZATIONS HANDBOOK:

ENVIRONMENTAL POLLUTION AND CONTROL FACTORS, THIRD EDITION

Mar. 1983 1214 p refs Prepared in cooperation with the Aerospace Corp. and Mueller Associates, Inc.

(Contracts DE-AC01-83EP-15100; DE-AC01-81EV-10450)

(DOE/EP-0093) Avail: NTIS HC A99/MF A01

Energy technologies and pollution control technologies are reviewed. Technology characterizations are given for the following energy sources: nuclear energy, synthetic fuels, coal, petroleum, natural gas, solar energy, geothermal energy, and hydroelectric energy. Air, water, and solid waste pollution control devices and mechanisms are presented for coal-fired power plants and industrial boilers and for synthetic fuel production from coal and oil shale. R.S.F.

N84-26118# Illinois Univ., Chicago.

A THEORETICAL ANALYSIS OF NATURAL CONVECTION TOWERS FOR SOLAR ENERGY CONVERSION

David D. Lasier and Eric W. Jacobs (Midwest Research Inst., Golden, Colo.) May 1983 12 p refs Presented at the Wind and Solar Energy Conf., Kansas City, Mo., 25 Apr. 1983

(Contract EG-77-C-01-4042)

(DE83-011956; SERI/TP-211-1960) Avail: NTIS HC A02/MF A01

A theoretical study of solar-powered natural convection tower (chimney) performance is presented. Both heated and cooled towers are analyzed, the latter using evaporating water as the cooling mechanism. The results, which are applicable to any open-cycle configuration, show that the ideal conversion efficiencies of both heated and cooled natural convection towers are linear functions of height. The performance of a heated tower in an adiabatic atmosphere ideally approaches the Carnot efficiency limit of approx. 3.4%/km (1.0%/1000 ft). Including water pumping requirements, the ideal limit to cooled tower performance is approx. 2.75%/km (0.85%/1000 ft). Ambient atmospheric conditions such as vertical temperature gradient (lapse rate) and relative humidity can have significantly adverse effects on natural convection tower performance. The combined effects of lapse rate and ambient relative humidity are especially important for cooled natural convection towers. Author

N84-26119# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

SOLAR AND INTERNAL GAIN ADJUSTMENTS IN CALCULATION OF ENERGY CONSERVATION SAVINGS

Craig Christensen and David Wortman Jul. 1983 8 p refs Presented at the ASES PASSIVE 83 Conf., Glorieta, N. Mex., 7-9 Sep. 1983

(Contract EG-77-C-01-4042)

(DE83-011983; SERI/TP-254-2019) Avail: NTIS HC A02/MF A01

Heating degree days are often used as a climatic measure in building energy calculations. To account for the effects of solar and internal gains, degree days at a lower base temperature are sometimes used, or the number of degree days is adjusted downward by a degree-day correction factor. A theoretical derivation which demonstrates that ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) C sub d factors are not the appropriate correction factors for calculation of energy savings from envelope conservation measures is presented. The results of this derivation can be used to develop new correlation factors appropriate for savings calculations. Author

N84-26120# Zaininger Engineering Co., San Jose, Calif.

INVESTIGATE ALTERNATIVE INTERCONNECTION STRATEGIES FOR ARRAYS OF WIND TURBINE GENERATORS Final Report

H. W. Zaininger and D. J. Bell Jul. 1983 112 p refs

(Contract W-7405-eng-26)

(ORNL/Sub-82/69604/1) Avail: NTIS HC A06/MF A01

One of the principal methods of interconnecting future wind turbine units to utility systems is expected to be in large megawatt (MW) scale arrays, connected to the utility transmission, subtransmission, or distribution (T&D) network at a common point, and operated together as any other MW scale utility generation plant. There are many potential alternative wind turbine (WT) array/utility system interconnection strategies. The purpose of this project was first to develop an appropriate methodology for assessing the relative cost, value, and reliability of alternative WT array interconnection plans; and second, to perform an initial assessment of a matrix of cases to demonstrate the T&D assessment methodology, as well as gain insights as to the potential cost, value, and reliability for array interconnection plans for a range of wind turbine sizes and types from a T&D perspective. Author

N84-26121# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

WIND ENERGY SYSTEMS FOR ELECTRIC UTILITIES: A SYNTHESIS OF VALUE STUDIES

Susan Hock and Theresa Flaim May 1983 12 p refs Presented at the 1983 ANN. Meeting of the American Solar Energy Society, Minneapolis, 1-3 Jun. 1983

(Contract EG-77-C-01-4042)

(DE83-011968; SERI/TP-214-1976) Avail: NTIS HC A02/MF A01

The results from five major studies that assess the value of wind energy conversion systems (WECS) to 14 electric utilities were normalized by a set of standard economic assumptions to facilitate comparisons across studies. The results indicate that WECS breakeven value in highly dependent on several factors: (1) wind resource, (2) utility generation mix, (3) assumed WECS penetration, and (4) year of WECS installation. The studies also show that WECS increase system reliability in many cases and thus can displace some capacity. This capacity displacement measured in terms of effective load-carrying capability declines with increasing WECS penetration. Sensitivity cases were examined to determine the effects of changes in utility financial parameters, fuel cost projections, WECS operation and maintenance costs, and the generation mix over time. R.J.F.

N84-26122# Lincoln Lab., Mass. Inst. of Tech., Lexington.

MATERIALS, PROCESSES AND TESTING LABORATORY. SUMMARIZING MODULE PERFORMANCE AT MIT LINCOLN LABORATORY EXPERIMENTAL PHOTOVOLTAIC TEST SITES, 1977 - 1982 Final Report

S. E. Forman and M. P. Themelis Jun. 1982 44 p refs

(Contract DE-AC02-76ET-20279)

(DOE/ET-20279/188) Avail: NTIS HC A03/MF A01

Over 11,000 photovoltaic (PV) modules were placed at experiment PV power generating systems in a number of field test sites in the United States. Prominent among these are a 100 kW system, a 25-kW system, and a 15-kW system. Through periodic surveillance, measurements and inspections, 470 electrically failed modules were located, removed and analyzed during this six year period. It is found that the principal causes of failure are: (1) cells cracked due to weathering or internal module stresses; (2) failed solder joints; (3) interconnects not soldered to rear sides of cells at assembly; (4) cells or interconnects electrically shorted to metallic substrates; and (5) broken or split interconnects. Details and photographs of many of the different types of failures are presented and some of the analysis techniques used to locate the failures are described. E.A.K.

N84-26123# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

AN ASSESSMENT OF DEHUMIDIFIER GEOMETRIES FOR DESICCANT COOLING SYSTEMS

Robert S. Barlow Jun. 1983 57 p refs

(Contract EG-77-C-01-4042)

(DE83-011991; SERI/TR-252-1529) Avail: NTIS HC A04/MF A01

Dehumidifier geometries for open-cycle, solid desiccant cooling

systems are assessed in order to identify those configurations which have the greatest potential of achieving performance levels that will make desiccant cooling systems economically competitive with conventional vapor-compression systems. Five dehumidifier designs are described and compared quantitatively. Compared characteristics were then related to the requirements of solar cooling application. The wound-ribbon dehumidifer design showed the highest ratio of Stanton number to friction factor and the lowest solid-side resistance to mass transfer of any geometry tested. Because of the high potential of the wound-ribbon configuration, it is recommended that further research be carried out to fully characterized this type of dehumidifier. R.S.F.

N84-26124# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
TECHNICAL AND COST BENEFITS OF LIGHTWEIGHT, STRETCHED-MEMBRANE HELIOSTATS
L. M. Murphy May 1983 41 p refs
(Contract EG-77-C-01-4042)
(DE83-009408; SERI/TR-253-1818) Avail: NTIS HC A03/MF A01

A stretched-membrane heliostat designed for solar thermal applications is discribed. In this solar reflector design, a thin film - which can be metal, polymeric, or composite - is stretched on a hollow toroidal frame, which offers a structurally efficient and optically accurate surface. Some of the major advantages of stretched - membrane heliostats are: (1) the reflector, support frame, and support structures can be made extremely lightweight, (2) the concept is simple, (3) structural efficiency and reduced weight translate to lower costs, and (4) the stretched-membrane reflector provides a very accurate optical surface which can be maintained under anticipated environmental loads. Results of design studies, performance predictions and analysis, and subscale testing are presented herein. R.S.F.

N84-26125# MCC Associates, Inc., Silver Spring, Md.
PROCEEDINGS OF THE PASSIVE AND HYBRID SOLAR ENERGY UPDATE
Nov. 1983 288 p refs Conf. held in Washington, D.C., 26-28 Sep. 1983 Prepared in cooperation with Rockwell International Corp., Canoga Park, Calif.
(Contract DE-AM03-76SF-00700)
(CONF-830980) Avail: NTIS HC A13/MF A01

Developments in passive and hybrid solar energy technologies are presented. Research in the areas of solar heating and cooling, solar houses, heat transfer, residential energy, energy consumption, building construction materials, phase change materials, photovoltaic cells, and heat storage is discussed. The transfer of solar energy technology from industry to the user community is addressed. For individual titles, see N84-26126 through N84-26164.

N84-26126# Los Alamos Scientific Lab., N. Mex.
COOLING-LOAD IMPLICATIONS FOR RESIDENTIAL PASSIVE SOLAR HEATING SYSTEMS
Robert W. Jones and Robert D. McFarland *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 2-8 refs (For primary document see N84-26125 16-44)
(Contract W-7405-eng-36)
Avail: NTIS HC A13/MF A01

The quantification of cooling loads in residential buildings, particularly buildings with passive solar heating systems, is described, along with the computer simulation model used for calculating cooling loads. A sample of interim results is also presented. The objective of the research is to develop a simple analysis method, useful early in the design, to estimate the annual cooling energy requirement of a given building. Author

N84-26127# Wisconsin Univ., Madison. Lab. for Solar Energy.
A CORRECTION FACTOR TO f-CHART PREDICTIONS OF ACTIVE SOLAR FRACTION IN ACTIVE-PASSIVE HEATING SYSTEMS
B. L. Evans, W. A. Beckman, J. A. Duffie, J. W. Mitchell, and S. A. Klein *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 9-14 refs (For primary document see N84-26125 16-44)
(Grant DE-FG02-81CS-30634)
Avail: NTIS HC A13/MF A01

The extent to which a passive system degrades the performance of an active solar space heating system was investigated, and a correction factor to account for these interactions was developed. The transient system simulation program TRNSYS is used to simulate the hour-by-hour performance of combined active-passive (hybrid) space heating systems in order to compare the active system performance with simplified design method predictions. The TRNSYS simulations were compared to results obtained using the simplified design calculations of the f-Chart method. Comparisons of TRNSYS and f-Chart were used to establish the accuracy of the f-Charts for active systems. A correlation was then developed to correct the monthly loads input into the f-Chart method to account for controller deadbands in both hybrid and active only buildings. A general correction factor was generated to be applied to the f-Chart method to produce more accurate and useful results for hybrid systems. Author

N84-26128# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
MEASURED VERSUS PREDICTED PERFORMANCE OF THE SERI TEST HOUSE: A VALIDATION STUDY
R. Judkoff, D. Wortman, and J. Burch *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 15-24 refs (For primary document see N84-26125 16-44)
(Contract EG-77-C-01-4042)
Avail: NTIS HC A13/MF A01

The reliability of building energy analysis simulations was investigated by testing key algorithms against detailed thermal performance data collected under controlled building operating conditions. Comparative studies showed significant disagreement among several programs when used to simulate the performance of passive solar buildings. The sources of prediction errors were assessed. R.S.F.

N84-26129# Department of Energy, Washington, D. C. Photovoltaic Systems Research and Technology Branch.
SYSTEMS INTEGRATION OF PHOTOVOLTAIC AND PASSIVE SOLAR
Andrew D. Krantz *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 25-30 (For primary document see N84-26125 16-44)
Avail: NTIS HC A13/MF A01

Photovoltaic technology and its adaptation to single family houses are described briefly. Design and insitutional issues are discussed. Expected technological and commercial advances in photovoltaic techology are identified. R.S.F.

N84-26130# Trinity Univ., San Antonio, Tex. Dept. of Physics.
ENERGY AND PEAK POWER SAVED BY PASSIVELY COOLED RESIDENCES
Gene Clark, Fred Loxsom, Earl Doderer, Robin Vieira, and Peter Fleischhacker *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 32-38 refs (For primary document see N84-26125 16-44)
Avail: NTIS HC A13/MF A01

The energy displacement potential of roof pond cooling in humid climates is sensitive to the type of dehumidification equipment employed and the humidity levels allowed. The simulated energy requirements of roof pond residences assisted by two high efficiency dehumidifier options are described. One dehumidifier was a vapor compression air conditioner with sensible cooling recovery by an air-to-air heat exchanger (improved mechanical dehumidification or IMD). The second option was a solar regenerated desiccant dehumidifier (SRDD). An IMD assisted roof pond house had energy savings of 30 to 65% in humid climates compared to the conventional house; an SRDD assisted roof pond house had energy savings of 70 to 75% in humid climates. Author

N84-26131# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Science Div.

THE RADIATIVE COOLING RESOURCE

Marlo Martin and Paul Berdahl *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 39-46 refs (For primary document see N84-26125 16-44)

(Contract DE-AC03-76SF-00098)

Avail: NTIS HC A13/MF A01

Results of an experimental infrared sky emissivity measurement program were combined with a method for estimating thermal radiation from clouds to develop an algorithm for calculating the effective sky temperature based on commonly recorded meteorological parameters. This algorithm is used with hourly weather data from 193 Typical Meteorological Year sites in the continental United States to produce contour maps and histograms for the sky temperature depression, and related resource information. Author

N84-26132# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

PREDICTING ENERGY SAVINGS ATTRIBUTED TO DAYLIGHTING

Claude L. Robbins *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 47-50 refs (For primary document see N84-26125 16-44)

(Contract EG-77-C-01-4042)

Avail: NTIS HC A13/MF A01

A method for estimating a building's energy savings attributable to daylighting by predicting the percentage of the year that the electric lighting system is not in use is described. This method depends upon the particular control stragegy chosen, a standard work year, and the amount of light (as a daylight factor, DF) reaching any given station in the building. Author

N84-26133# California Univ., Berkeley. Lawrence Berkeley Lab. Passive Research and Development Group.

THE PREDICTED IMPACT OF LINEAR ROOF APERTURES ON THE ENERGY PERFORMANCE OF OFFICE BUILDINGS

Wayne Place, Pascal Coutier, Marc Fontoynont, Ronald C. Kammerud, Brandt Andersson, Fred Bauman, William L. Carroll, Thomas C. Howard, Atila Mertol, and Thomas L. Webster (Synergetic, Inc.) *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 52-62 refs (For primary document see N84-26125 16-44)

(Contract DE-AC03-76SF-00098)

Avail: NTIS HC A13/MF A01

The potential lighting electricity reductions and associated thermal impacts of replacing electric light with sunlight admitted through rooftop glazing on a single-story, prototypical office building were investigated. Experimental scale models were used to determine the fraction of the solar radiation entering the aperture which reaches the work plane as useful illumination. From this building energy analysis computer program was generated. Results of computer simulation indicate that a large fraction of the electricity consumed for lighting a single-story office building can be displaced using modest amounts of glazing in the roof. Smaller heating and cooling energy consumption reductions are possible from a daylighting system. The design implications of the results are discussed and future directions for the work are outlined. Author

N84-26134# Los Alamos Scientific Lab., N. Mex. Solar Energy Group.

STATUS OF THE CLASS A PERFORMANCE EVALUATION PROGRAM

Bruce D. Hunn *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 63-69 refs (For primary document see N84-26125 16-44)

(Contract W-7405-eng-36)

Avail: NTIS HC A13/MF A01

A program to collect, analyze, and archive detailed test data for the rigorous validation of analysis/design tools used for passive solar research and design is described. Program accomplishments in the areas of: (1) data needs and test facilities, (2) development of a validation methodology, and (3) collection, analysis, and archiving of test data are presented. The primary work reported is in the third area, where several high-quality data sets were analyzed by comparison with public-domain passive solar analysis tools. Measured-versus-predicted results are presented in a standard graphical and statistical summary format. Author

N84-26135# National Bureau of Standards, Washington, D.C. Building Equipment Div.

RESULTS FROM THE NBS PASSIVE TEST BUILDING: A STATUS REPORT

Bal M. Mahajan and Stanley T. Liu *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 71-78 refs (For primary document see N84-26125 16-44)

(Contract DE-Alo1076PR-06010)

Avail: NTIS HC A13/MF A01

A passive solar test building, which has been operational since October 1981 is described. The test building was constructed to acquire class A performance monitoring data for various passive systems under different experimental conditions. The test building, instrumentation and data acquisition system, continuous air infiltration monitoring system and experimental work conducted are described. The report contains representative data, and briefly describes the research activities planned for the future. E.A.K.

N84-26136# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.

PARAMETER ESTIMATION AND INFILTRATION TESTS AT THE REPEAT FACILITY

Pat Burns, Peter Armstrong, and Byron Winn *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 80-86 refs (For primary document see N84-26125 16-44)

(Contract DE-AC02-80CS-30259)

Avail: NTIS HC A13/MF A01

Work performed in the reconfigurable passive evaluation analysis and test (REPEAT) facility is reviewed. The physical characteristics of the building and the instrumentation are described. Collected data are discussed. Treatment of parameter estimation ensures with example calculations. Infiltration instrumentation and tests are described. Flow visualization studies are discussed. E.A.K.

N84-26137# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

PASSIVE SOLAR MANUFACTURED BUILDINGS DEVELOPMENT AND ANALYSES

Robert deKieffer *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 87-91 (For primary document see N84-26125 16-44)

Avail: NTIS HC A13/MF A01

Manufactured buildings which are cost effective residential and light commercial buildings are discussed. The solar energy research institute (SERI) and the Department of Energy (DOE) worked with building manufacturers design, develop, and build passive solar manufactured buildings. This development process lead to valuable information in design development and design options, cost analysis, and estimated and monitored thermal performance on all types of manufactured buildings. The scope and content are described. E.A.K.

N84-26138# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

MEASURED PERFORMANCE OF 50 PASSIVE SOLAR RESIDENCES IN THE UNITED STATES

Joel N. Swisher and John J. Duffy (Duffy (J. J.) and Assoc.) *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 93-97 refs (For primary document see N84-26125 16-44)

(Contract EG-77-C-01-4042)

Avail: NTIS HC A13/MF A01

The thermal performance of 50 passive solar residences in a variety of U.S. locations is summarized. These buildings were monitored as part of the Solar Energy Research Institute (SERI)

Residential Class B Passive Solar Performance Monitoring Program. The monitoring and performance evaluation methods are described and the overall heating season performance of the buildings are presented in graphical form. The validity of extrapolating the data generated to passive solar buildings in general is discussed.
Author

N84-26139# National Association of Home Builders Research Foundation, Inc., Rockville, Md.
DEVELOPMENT OF AN INDUSTRY-BASED RESIDENTIAL THERMAL PROGRAM EVALUATION PROGRAM
Donald J. Frey, Bradley D. Collins, and Paul F. Kando *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 99-102 refs (For primary document see N84-26125 16-44)
(Contract DE-AC02-83CE-89000)
Avail: NTIS HC A13/MF A01

A multi-year program to develop methodology and equipment for providing the construction industry with meaningful information on the performance of passive solar housing is outlined. The tasks and subtasks involved in project management are presented.
R.S.F.

N84-26140# National Association of Home Builders Research Foundation, Inc., Rockville, Md.
INTERNATIONAL ENERGY AGENCY SOLAR HEATING AND COOLING PROGRAMME: TASK 8, PASSIVE AND HYBRID SOLAR LOW ENERGY BUILDINGS
Michael J. Holtz *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 104-112 (For primary document see N84-26125 16-44)
(Contract DE-AC02-82F1-11680)
Avail: NTIS HC A13/MF A01

The background of and results achieved by the International Energy Agency are discussed. Task objectives approach, and participants are presented as well as results from two international surveys on simulation models and design tools. Conventional reference buildings are described representative of typical design and construction practice in each country and will be used as a basis of comparison to passive/hybrid designs developed. Work in progress is briefly described along with Agency information dissemination activities.
Author

N84-26141# Burt, Hill, Kosar, Rittleman, and Associates, Washington, D.C.
THE DOE PASSIVE SOLAR COMMERCIAL BUILDINGS PROGRAM: PRELIMINARY RESULTS OF PERFORMANCE EVALUATION
Ronald Lutha (DOE, Argonne, Ill.), Peter G. Rockwell, William J. Fisher, and Harry T. Gordon *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 113-117 (For primary document see N84-26125 16-44)
(Contract DE-AC02-81CS-30632)
Avail: NTIS HC A13/MF A01

The U.S. Department of Energy is conducting performance evaluation of the buildings in the Passive Commercial Buildings Program. The objectives of the effort are: (1) to determine how much auxiliary energy is being saved by these passive solar buildings over non-solar buildings, and (2) to determine whether the buildings function, or are perceived to function, as well as non-solar buildings. Some preliminary results of the evaluation are: that the buildings are, in fact, saving significant amounts of energy in comparison to non-solar buildings; that majority of the occupants are satisfied overall with the buildings; that occupancy of the buildings can be substantially different than what was assumed during design; and that passive buildings require a great deal of communication between designers, vendors, and contractors for successful construction.
Author

N84-26142# Architectural Energy Corp., Westminster, Colo.
FIELD INSTRUMENTATION FOR THE PASSIVE SOLAR COMMERCIAL BUILDINGS MONITORING PROGRAM
Donald J. Frey *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 119-120 refs (For primary document see N84-26125 16-44)
(Contract DE-AC02-82CE-30749)
Avail: NTIS HC A13/MF A01

Twenty commercial buildings have been built with partial funding from the U.S. Department of Energy (DOE) as part of the Passive Solar Commercial Buildings Program. Project teams associated with each building have a contractual responsibility to provide DOE with energy consumption data for major end-uses. The objectives of the work being performed by Architectural Energy Corporation (AEC) are: (1) to add consistency, reliability and accuracy to the individual monitoring projects; (2) to prepare the continuously collected data in a common format for archival by the A.I.A. Foundation; and (3) to provide data to Lawrence Berkeley Laboratory (LBL) for daylighting studies in two of the buildings.
Author

N84-26143# California Univ., Berkeley. Lawrence Berkeley Lab. Passive Research and Development Group.
THERMAL EFFECTS RESULTING FROM OCCUPANT BEHAVIOR AND BUILDING OPERATION
Brandt Andersson, Mari Adegran, Tom Webster, Ron Kammerrud, and Wayne Place *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 122-127 refs (For primary document see N84-26125 16-44)
(Contract DE-AC03-76SF-00098)
Avail: NTIS HC A13/MF A01

Issues related to occupant activity in passive commercial buildings were investigated to determine their energy impacts. Total building energy analyses were performed to identify the heating, cooling and lighting effects of a variety of occupant requirements and activities. The evaluation phase of the Passive Commercial Experimental Buildings Program is described; the interaction of occupancy and thermal/energy evaluation is discussed. The methods used to evaluate the effect of occupants on daylighting performance in two of the buildings are described and progress on that activity is detailed. Preliminary results of investigations into occupant-related aspects of the use of thermal mass in commercial buildings and analysis plans for further investigation are presented. Additional areas of investigation are identified and discussed.
M.G.

N84-26144# Kantrowitz (Min) and Associates, Inc., Albuquerque, N. Mex.
DO USERS RUIN DESIGN INTENTIONS?
Min Kantrowitz *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 129-134 refs (For primary document see N84-26125 16-44)
Avail: NTIS HC A13/MF A01

The approach to examining the relationship between occupants and energy use currently being implemented through the U.S. Department of Energy Passive Solar Commercial Buildings Program is described. Preliminary findings related to how occupant behavior influences energy use and how users respond to these passive solar commercial buildings are presented. Most building users seem to be satisfied with conditions in the buildings-the patterns of the relatively few complaints about comfort reveal cool, sometimes drafty mornings and warm afternoons. Some concern about acoustics was also expressed. The issue of user operations in the buildings is a more pervasive one-there are many instances of improper operations of the buildings, due to a variety of factors. There is a need for clear, well managed user orientation programs, and an explicit transfer of responsibility for certain building operations to the users.
M.G.

N84-26145# Pacific Northwest Lab., Richland, Wash. Energy Systems Dept.
WHOLE BUILDING PERFORMANCE MONITORING: MEASUREMENTS ON BASELINE BUILDINGS
John Stoops and Ted Kurkowski (DOE) *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 136-139 (For primary document see N84-26125 16-44)
(Contract DE-AC06-76RL-01830)

Avail: NTIS HC A13/MF A01

Large amounts of energy consumed in buildings can be cost effectively conserved, and the state of the art data acquisition systems identifies and characterizes such opportunities at low cost, for which metered data were completed. The acquisition of a data base to fulfill the needs of various users is discussed. The project entails an inventory of existing data sources, and an assessment of the adequacy of available data to study the energy use interactions of typical commercial buildings. Compilation of an accurate and easily accessible source of hourly end use consumption data and determinants is undertaken. Low cost data acquisition techniques were developed. E.A.K.

N84-26146# Department of Energy, Washington, D. C. Building Energy Sciences Branch.

PERFORMANCE MONITORING HIGHLIGHTS OF BERD PROGRAMS

Jean J. Boulin and Howard D. Ross *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 141-145 (For primary document see N84-26125 16-44)

Avail: NTIS HC A13/MF A01

Building performance monitoring is the measuring, through the use of instrumentation, the characteristics of a whole building or some components or set of components of a building. Component and whole building performance are addressed. In the component area these programs address performance monitoring in the areas of: (1) infiltration and ventilation; (2) thermal mass in walls; and (3) windows and daylighting. Some examaples of whole building monitoring concern: model validation and performance characterization. Activities with examples are reviewed. E.A.K.

N84-26147# Burt, Hill, Kosar, Rittleman, and Associates, Butler, Pa.

SURVEY OF DESIGN TOOLS FOR PASSIVE AND HYBRID LOW ENERGY BUILDINGS

P. Richard Rittelmann, James E. Davy, and Syed F. Ahmed *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 146-151 (For primary document see N84-26125 16-44)

Avail: NTIS HC A13/MF A01

Design tools for passive and hybrid low energy buildings were surveyed as part of the solar heating and cooling program. A total of 164 design tools were surveyed. The design tools are categorized in various ways. The need for further design tools development for certain application is identified. E.A.K.

N84-26148# American Consulting Engineers Council, Washington, D.C. Research and Management Foundation.

DEVELOPMENT OF AN EVALUATION METHODOLOGY FOR PASSIVE SOLAR DESIGN TOOLS

Alexander J. Willman *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 155-158 refs (For primary document see N84-26125 16-44)

(Contract DE-AC02-83CE-30752)

Avail: NTIS HC A13/MF A01

The progress in developing an evaluation methodology for passive solar design tools is described. Four subtasks are described: (1) an identification of previous design tool evaluation attempts; (2) the development of a categorization method for building energy design tools. The third and fourth subtasks will build on the first two to develop the evaluation procedure. The planned activities of these two subtasks are described. E.A.K.

N84-26149# National Concrete Masonry Association, Herndon, Va. Technical Services Dept.

MULTI-FAMILY UPDATE TO THE PASSIVE SOLAR CONSTRUCTION HANDBOOK

Bion D. Howard and Kevin D. Callahan *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 160-164 refs (For primary document see N84-26125 16-44)

(Grant DE-FG02-82CE-30748)

Avail: NTIS HC A13/MF A01

Builders and developers will accept passive solar construction and designs for integration with their existing practice if accurate and detailed plans of actual, proven passive solar subsystems and assemblies are made available to them. A Passive Solar Construction Handbook was developed. It focuses primarily upon single family homes. The multifamily update of the Handbook, is described and examples of the valuable builder information are shown. It represents a new breakthrough in DOE sponsored projects, performing a Technology Transfer on a most useful level. E.A.K.

N84-26150# Energy Technology Engineering Center, Canoga Park, Calif. Energy Systems Group.

OVERVIEW OF ROOF POND SYSTEMS

William P. Marlatt, Kathy A. Murray, and Steven E. Squier *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 165-166 (For primary document see N84-26125 16-44)

Avail: NTIS HC A13/MF A01

An overview of a technical report on roof pond systems is presented. The document discusses how the information for the report was gathered, the contents of the report, and the current status of completion. A summary of the impact of the report on the solar community and a general conclusions are included as well as information on the availability of the report. E.A.K.

N84-26151# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

THE TRANSFER OF PASSIVE RESEARCH AND DEVELOPMENT RESULTS TO INDUSTRY AND THE USER COMMUNITY

H. Dana Moran *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 168-171 (For primary document see N84-26125 16-44)

Avail: NTIS HC A13/MF A01

The Federal investment in research and development of renewable energy technologies which is valuable if the results of such R&D are transferred to the private sector, which result in products and processes of benefit to society. The Passive and Hybrid Solar Energy Program is one for which Congress has designated specific funds to support technology transfer. A Passive Technology Transfer Plan was established which employs both established mechanisms and innovative approaches to fostering the prompt transfer of new technologies to private and public sector users. Key to the success of this plan is the participation of both user representatives and intermediaries in the transfer process. E.A.K.

N84-26152# Whiddon (William I.) and Associates, Inc., Bethesda, Md.

A LABORATORY APPROACH TO TECHNOLOGY TRANSFER: THE PASSIVE SOLAR COOLING SYSTEM CONCEPT EXAMPLE

William I. Whiddon and G. Kimball Hart (Hart, McMurphy and Parks) *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 172-175 (For primary document see N84-26125 16-44)

Avail: NTIS HC A13/MF A01

The technology transfer aspects of a research project conducted by DOE/SAN, Lawrence Berkeley Laboratory, Los Alamos National Laboratory and a group of building design professionals are discussed. The focus was to develop a schematic building system concept that functions in the manner assumed in the systems analysis work on passive cooling technology assessments. The work involved two design workshops. The purpose, methods and conclusions of the work and observations on how the process can aid early technology transfer of laboratory research and identify significant research issues from a practitioner perspective are presented. E.A.K.

N84-26153# Rational Alternatives, Santa Fe, N. Mex. Showcase of Solar Homes Project Office.

PASSIVE SOLAR DESIGN GUIDELINES AND EVALUATION CRITERIA FOR BUILDERS

Mark L. Conkling *In* MCC Assoc., Inc. Proc. of the Passive and

Hybrid Solar Energy Update Nov. 1983 p 177-184 (For primary document see N84-26125 16-44)
Avail: NTIS HC A13/MF A01

The showcase of Solar Homes, which features two model solar villages in Eldorado at Santa Fe and Rio Rancho, New Mexico is described. Key features of the project which include its privete sector character, marketplace considerations, and the need for uniform solar home quality are pointed out. Guidelines using a balance of conservation and passive solar were set and the issue of occupant comfort were addressed. The guidelines were used to establish criteria and worksheets for builders seeking entry into the Showcase project. Designs become examples of the transfer of research to practice. The guidelines for solar builders directly transfers passive solar research and technology to the builders. E.A.K.

N84-26154# Los Alamos Scientific Lab., N. Mex.
CONVECTIVE HEAT TRANSFER INSIDE PASSIVE SOLAR BUILDINGS
Robert W. Jones, J. Douglas Balcomb, and Kenjiro Yamaguchi *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 192-197 refs (For primary document see N84-26125 16-44)
(Contract W-7405-eng-36)
Avail: NTIS HC A13/MF A01

Natural convection between spaces in a building which play a major role in energy transfer are discussed. Two situations are investigated: Convection through a single doorway into a remote room, and a convective loop in a two story house with a south sunspace where a north stairway serves as the return path. A doorway sizing equation is given for the single door case. Data from airflow monitoring in one two-story house and summary data for five others are presented. The nature of the airflow and design guidelines are presented. E.A.K.

N84-26155# California Univ., Berkeley. Lawrence Berkeley Lab. Passive Research and Development Group.
COMPUTER PROGRAM FOR STUDYING TURBULENT CONVECTION IN BUILDINGS
Atila Mertol, Hashem Akbari, Ashok Gadgil, Fred Bauman, Emmanuel Altmayer, and Ron Kammerud *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 200-206 refs (For primary document see N84-26125 16-44)
(Contract DE-AC03-76SF-00098)
Avail: NTIS HC A13/MF A01

A computer program was developed to study convection in enclosures. The code uses a k-epsilon model for prediction of laminarization of turbulence. Predictions of the program are compared with experimental and numerical data for a pressure-driven, constant temperature, two-dimensional channel flow with Reynolds number 12800. The preliminary comparisons indicate good agreement between the predicted and experimental velocity profiles. M.G.

N84-26156# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Science Div.
ADVANCED OPTICAL AND THERMAL TECHNOLOGIES FOR APERTURE CONTROL
Stephen E. Selkowitz, Carl M. Lampert, and Michael Rubin *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 208-217 refs (For primary document see N84-26125 16-44)
(Contract DE-AC03-76SF-00098)
Avail: NTIS HC A13/MF A01

Control of heat transfer and radiant energy flow through building apertures is essential for maximizing thermal and daylighting benefits and minimizing undesired heating and cooling loads. Architectural solutions based on current technology generally add devices such as louvers, shutters, shades, or blinds to the glazing system. The objectives and initial accomplishments of a research program are outlined, the goal of which is to identify and evaluate advanced optical and thermal technologies for controlling aperture energy flows, thus reducing building energy requirements. Activities in four program areas are described: (1) low-conductance, high-transmittance glazing materials (e.g., heat mirrors, aerogels); (2) optical switching materials (e.g., electrochromic, photochromic); (3) selective transmitters; and (4) daylight enhancement techniques. M.G.

N84-26157# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Science Div.
TRANSPARENT AEROGELS FOR LOW-CONDUCTANCE WINDOWS
Arlon J. Hunt *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 218-223 refs (For primary document see N84-26125 16-44)
(Contract DE-AC03-76SF-00098)
Avail: NTIS HC A13/MF A01

Microporous optical materials that are highly transparent and possess excellent thermal insulating properties are being developed at LBL for insulating window applications. The material, called aerogel, consists of nearly pure silica with high fraction of voids (up to 97% by volume). Research and development is being carried out at LBL to improve the optical and thermal properties, stabilize the material and reduce its production cost. Author

N84-26158# EIC, Inc., Newton, Mass.
VARIABLE TRANSMITTANCE ELECTROCHROMIC WINDOWS
R. David Rauh *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 225-230 refs (For primary document see N84-26125 16-44)
(Contract DE-AC02-82CE-30746)
Avail: NTIS HC A13/MF A01

Electrochromic apertures based on RF sputtered thin films of WO3 are projected to have widely different sunlight attenuation properties when converted to MxWO3 (M = H, Li, Na, Ag, etc.), depending on the initial preparation conditions. Amorphous WO3, prepared at low temperature, has a coloration spectrum centered in the visible, while high temperature crystalline WO3 attenuates infrared light most efficiently, but appears to become highly reflective at high values of x. The possibility therefore exists of producing variable light transmission apertures of the general form (a-MxWO3/FIC/c-WO3), where the FIC is an ion conducting thin film, such as LiAlF4 (for M = Li). The attenuation of 90% of the solar spectrum requires an injected charge of 30 to 40 mcoul/sq cm in either amorphous or crystalline WO3, corresponding to 0.2 Whr/sq m per coloration cycle. In order to produce windows with very high solar transparency in the bleached form, new counter electrode materials must be found with complementary electrochromism to WO3. M.G.

N84-26159# Tufts Univ., Medford, Mass. Dept. of Electrical Engineering.
OPTICS AND MATERIALS RESEARCH FOR CONTROLLED RADIANT ENERGY TRANSFER IN BUILDINGS
Ronald B. Goldner *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 232-238 refs (For primary document see N84-26125 16-44)
(Contract DE-AC02-82CE-30753)
Avail: NTIS HC A13/MF A01

The overall objective of the Tufts research program was to identify and attempt to solve some of the key materials problems associated with practical approaches for achieving controlled radiant energy transfer (CRET) through building windows and envelopes, so as to decrease heating and cooling loads in buildings. Major accomplishments included: the identification of electrochromic (EC)-based structures as the preferred structures for achieving CRET; the identification of modulated reflectivity as the preferred mode of operation for EC-based structures; demonstration of the feasibility of operating EC-materials in a modulated R(lambda) mode; and demonstration of the applicability of free electron model to colored polycrystalline WO3 films. M.G.

N84-26160# National Bureau of Standards, Washington, D.C.
INITIAL RESULTS FROM TESTING PASSIVE SOLAR COMPONENTS IN THE NBS CALORIMETER

Micheal E. McCabe and E. Hancock *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 240-246 refs (For primary document see N84-26125 16-44)
(Contract DE-AI01-76PR-06010)
Avail: NTIS HC A13/MF A01

Studies of thermal performance of passive solar buildings have indicated a need for precise measurement of solar and thermal energy transfer in modular passive/hybrid solar components under conditions of actual use. A description of the design and initial operational results for a new calorimetric test facility is presented. The facility is designed for testing of passive solar components at the National Bureau of Standards in Gaithersburg, MD. It is anticipated that the test facility will provide a substantial improvement in the measuring techniques for passive and hybrid solar components over other methods currently in use and thereby provide a firm technical basis from which laboratory test procedures can be evaluated. M.G.

N84-26161# Los Alamos Scientific Lab., N. Mex.
VAPOR-PHASE HEAT-TRANSPORT SYSTEM
James C. Hedstrom *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 247-251 refs Previously announced as N84-13516 (For primary document see N84-26125 16-44)
(Contract W-7405-eng-36)
Avail: NTIS HC A13/MF A01

A vapor-phase heat-transport system is being tested in one of the passive test cells at Los Alamos. The system consists of one selective-surface collector and a condenser inside a water storage tank. The refrigerant, R-11, can be returned to the collector by gravity or with a pump. Results from several operating configurations are presented, together with a comparison with other passive systems. A new self-pumping concept is presented.
Author

N84-26162# Mueller Associates, Inc., Baltimore, Md.
DEVELOPMENT OF SOLAR MATERIALS AND COMPONENTS
James S. Moore *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 253-259 (For primary document see N84-26125 16-44)
(Contract DE-AC02-80CS-30603)
Avail: NTIS HC A13/MF A01

The evolution of solar technologies supported by DOE's Passive Materials and Components Research Program is discussed. The successful introduction of those technologies and hybrid concepts into the building industry is then examined. Energy collection, storage, control, and rejection/dehumidification projects are addressed. M.G.

N84-26163# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLID STATE PHASE CHANGE MATERIALS FOR THERMAL ENERGY STORAGE IN PASSIVE SOLAR HEATED BUILDINGS
David K. Benson and Craig Christensen *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 261-265 refs (For primary document see N84-26125 16-44)
(Contract EG-77-C-01-4042)
Avail: NTIS HC A13/MF A01

A set of solid state phase change materials was evaluated for possible use in passive solar thermal energy storage systems. The most promising materials are organic solid solutions of pentaerythritol, pentaglycerine and neopentyl glycol. Solid solution mixtures of these compounds can be tailored so that they exhibit solid-to-solid phase transformations at any desired temperature within the range from less than 25 deg to 188 deg. Thermophysical properties such as thermal conductivity, density and volumetric expansion were measured. Computer simulations were used to predict the performance of various Trombe wall designs incorporating solid state phase change materials. Optimum performance was found to be sensitive to the choice of phase change temperatures and to the thermal conductivity of the phase change material. A molecular mechanism of the solid state phase transition is proposed and supported by infrared spectroscopic evidence. M.G.

N84-26164# Dayton Univ., Ohio. Research Inst.
PHASE CHANGE MATERIALS FOR USE IN PASSIVE AND HYBRID SOLAR HEATING AND COOLING SYSTEMS
Donovan S. Duvall and Ival O. Salyer *In* MCC Assoc., Inc. Proc. of the Passive and Hybrid Solar Energy Update Nov. 1983 p 267-270 refs (For primary document see N84-26125 16-44)
(Contract DE-AC02-82CE-30755)
Avail: NTIS HC A13/MF A01

Six different types of phase change materials (PCM) were evaluated for their suitability for use in passive thermal storage applications in residential buildings. The PCM's under investigation include: straight chain hydrocarbons; poly(ethylene glycols); polymers having long alkyl side chains; semiclathrates of quaternary ammonium halides; semiclathrates of amines, diamines, and triamines quaternized with aklyl halides; and semiclathrates of polymers of quaternized amine containing monomers. Desirable features of candidate PCM's include: congruent phase change, little or no supercooling, not flammable, good thermal conductivity, noncorrosive, nontoxic, and, finally, a proper melting point along with a high heat of fusion. M.G.

N84-26165*# Energy Research Corp., Danbury, Conn.
FULL SCALE PHOSPHORIC ACID FUEL CELL STACK TECHNOLOGY DEVELOPMENT Final Technical Report
L. Christner and M. Farooque Mar. 1984 99 p refs
(Contracts DEN3-205; DE-AI21-80ET-17088)
(NASA-CR-174660; DOE/NASA/0205-8; NAS 1.26:174660) Avail: NTIS HC A05/MF A01 CSCL 10A

The technology development for phosphoric acid fuel cells is summarized. The preparation, heat treatment, and characterization of carbon composites used as bipolar separator plates are described. Characterization included resistivity, porosity, and electrochemical corrosion. High density glassy carbon/graphite composites performed well in long-term fuel cell endurance tests. Platinum alloy cathode catalysts and low-loaded platinum electrodes were evaluated in 25 sq cm cells. Although the alloys displayed an initial improvement, some of this improvement diminished after a few thousand hours of testing. Low platinum loading (0.12 mg/sq cm anodes and 0.3 mg/sq cm cathodes) performed nearly as well as twice this loading. A selectively wetproofed anode backing paper was tested in a 5 by 15 inch three-cell stack. This material may provide for acid volume expansion, acid storage, and acid lateral distribution. R.S.F.

N84-26166# Kaiserslautern Univ. (West Germany). Fachbereich Physik.
PREPARATION OF THIN AMORPHOUS SILICON FILMS FOR THIN FILM SOLAR CELLS Final Report, Sep. 1982
Juergen Geiger and Bernd Schroeder Bonn Bundeministerium fuer Forschung und Technologie Feb. 1984 101 p refs In GERMAN; ENGLISH summary Sponsored by Bundeministerium fuer Forschung und Technologie
(BMFT-FB-T-84-018; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21,50

The aim of the research project was to prepare amorphous silicon films by evaporation or sputtering which exhibit a sufficiently low density of states within the gap between conduction and the valence band and which are therefore suitable to solar-cell application. It was shown that under conventional conditions impurity atoms are incorporated into the films, which may generate defect states in the gap. Therefore, ultrahigh vacuum technique was employed. Films made by evaporation must be deposited in an atmosphere of predissociated hydrogen onto a heated substrate; then substitutionally doping from the gas phase, e.g. by phosphorus is possible. The sputtered films were prepared by the usual method of reactive sputtering in an argon-hydrogen mixture. With the UHV magnetron sputtering system, a binary silicon hydrogen alloy is deposited at a well-defined hydrogen partial pressure onto a heated substrate. R.J.F.

N84-26167# Ludwig-Maximilians-Universitaet, Munich (West Germany). Sektion Physik.
IMPROVEMENT OF FLAT PLATE COLLECTORS FOR SOLAR ENERGY CONVERSION Final Report, Apr. 1982
Hubert Boeck, Reinhard Hallermayer, Wolfgang Schoelkopf, and Rudolf Sizman Bonn Bundesministerium fuer Forschung und Technologie Mar. 1984 150 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-042; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 31,50

Selective absorption for thermal conversion of radiative energy was investigated. Improvement and operation of various measuring devices for absorption and emission are presented. Selective coatings were produced by vapor deposition and galvanic treatment. Calculations of the transmittance of turbular collector fields are presented. Operational Characteristics of Collector were examined. A collector test field with simultaneous recording of data from 24 collectors or uncovered absorbers was built and connected to a high performance microprocessor system. The transient behavior of collectors by variation of the irradiation and the collector inlet temperature were investigated. A mechanism for stratification of hot water of fluctuating inlet temperature in a storage tank was studied. The operating conditions of a heat pump installed in the collector test plant are investigated. A large domestic hot water system is equipped with temperature sensors and flowmeters for computer recording. E.A.K.

N84-26168# Schlaich und Paetner Beratende Ingenieure im Bauwesen, Stuttgart (West Germany).
A PHOTOVOLTAIC CONCENTRATOR FOR 500 Wpk USING A C50-Si GENERATOR AND A GLASS-LAMINATED METAL MEMBRANE REFLECTOR Final Report, Mar. 1983
Wilfried Haaf Bonn Bundesministerium fuer Forschung und Technologie Mar. 1984 67 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-050; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14

Large metal membrane reflectors of high optical quality enable the mass production of solar concentrators. The construction of a small prototype system combining a 3 m diameter reflector with a photovoltaic energy converter is discussed. The very simple construction method allows the concentration ratios up to 2000 suns. It is not fully used, because the concentration ratio and the cooling system had to match the restricting requirements of the C50-Si-generator, which consists of recently developed monocrystalline si-cells of high grid density. The overall system efficiency is about 6%. The application of the new and very simple membrane technology makes the production of electricity using large reflectors economically feasible. E.A.K.

N84-26169# Naval Civil Engineering Lab., Port Hueneme, Calif.
FEASIBILITY OF USING PHOTOVOLTAIC POWER SYSTEMS (PPS) WITH HIGH PRESSURE SODIUM (HPS) LAMPS FOR MAGAZINE ENTRY LIGHTING Technical Note, Oct. 1981 - Sep. 1982
G. Watson Jan. 1984 24 p
(S03-71)
(AD-A140146; NCEL-TN-1685) Avail: NTIS HC A02/MF A01 CSCL 10/2

New physical security requirements call for nighttime entry lighting to DOD magazines. Many magazine compounds do not have immediate access to electrical powerlines. Photovoltaic power coupled with high efficiency lamps is discussed in this document, and the advantages of this type of system are discussed. Cost comparisons with grid-connected lights are presented.
Author (GRA)

N84-26170# California Univ., Berkeley. Building Energy Simulation Group.
DOE-2, BDL SUMMARY, VERSION 2.1B
Jan. 1983 97 p Revised
(Contract DE-AC03-76SF-00098)
(LBL-8688-Rev-3) Avail: NTIS HC A05/MF A01

All of the computer commands and keywords in the Building Description Language (BDL) are enumerated. The BDL language is incorporated in computerized simulations of such parameters as building energy requirements, energy costs, and heating equipment life cycles. R.S.F.

N84-26171# California Univ., Berkeley. Building Energy Simulation Group.
DOE-2, SUPPLEMENT, VERSION 2.1B
Jan. 1983 130 p refs Revised
(Contract DE-AC03-76SF-00098)
(LBL-8706-Rev-3-Suppl) Avail: NTIS HC A07/MF A01

A computer program is described that simulates the illuminance of daylight inside a building over a variety of weather conditions. Parameters include window size, glass transmittance, inside surface reflectance of the space, Sun control devices, and luminance of the sky. Hourly daylight calculations are made and used to automatically close window blinds to maintain a predetermined comfort level. The program controls artificial lighting to compensate for any loss of illuminance. M.A.C.

N84-26172# Academic Computer Center, Utrecht (Netherlands). Inst. of Energy Conversion.
EFFECT OF OPERATING TEMPERATURE ON THE HWB MODEL FOR SOLAR-COLLECTOR DESIGN
Hanhao Huang and J. R. Howell (Texas Univ., Austin) Feb. 1983 25 p refs
(DE84-900248; UT/CES-SS-1) Avail: NTIS HC A02/MF A01

The Hottel-Whillier-Bliss (HWB) Model for the thermal efficiency of a flat plate solar collector plots as a straight line in an esa/sub c/ approx. (T/sub f,in/ - T/sub a/)/g/sub s/ coordinate system under the following assumptions: (1) the effect of the thermal capacity in the collector is negligible; (2) F/sub R/, U/sub L/ are constant in the range of operating temperature. These assumptions simplify the model and make it convenient to use. Because of the intermittance of insulation and the variation of ambient temperature and wind speed, the thermal capacity of the collector may affect the transient efficiency of the collector. In addition, the values of F/sub R/ and U/sub L/ are actually not constant and cause deviation of the efficiency curve from a straight line. The concern is with the deviation of the confidence level for a specific operating range. The effect of operating temperature of the values of F/sub R/ and U/sub L/ is discussed. DOE

N84-26173# Idaho Univ., Moscow. Dept. of Chemistry.
IMPROVED ACID ELECTROLYTES FOR FUEL CELLS Annual Report, Jan. - Dec. 1983
J. M. Shreeve Jan. 1984 18 p refs Sponsored by Gas Research Inst.
(PB84-179779; GRI-84/0028) Avail: NTIS HC A02/MF A01 CSCL 10B

Several fluorine-containing sulfur (VI) and phosphorus (V) compounds were synthesized for possible use as electrolytes in synthetic fuel cells. In addition, some fluorinated olefin precursors to additional acids were prepared along with new sultones, sulfinyl fluorides, and sulfuryl fluorides as hydrolyzable intermediates. Mass spectra and infrared spectra data are presented for the synthesized compounds. R.S.F.

N84-26174# WAPORA, Inc., Washington, D.C.
SURVEY OF ENVIRONMENTAL REGULATIONS APPLYING TO GEOTHERMAL EXPLORATION, DEVELOPMENT AND USE Final Report
Mar. 1984 251 p refs
(Grant EPA-68-01-5913)
(PB84-173665; EPA-600/2-84-082) Avail: NTIS HC A12/MF A01 CSCL 10A

Federal, State, and local environmental laws and regulations that apply to geothermal energy development are summarized.

Most attention is given to those regulations which deal with air pollution, water pollution, solid wastes and impact assessments. Analyses are made of the regulations with respect to resource definition, pollutants not controlled, duplicity and overlap in permit and impact assessment requirements, the lack of uniformity of regulations between states, and the probable future approaches to the regulatory problems. This project updates a similar document (EPA/600/7-78-014) dated February 1978. GRA

N84-26452 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
ENERGY SOURCE TODAY AND TOMORROW [BIOGAS EINE ENERGIEQUELLE VON HEUTE UND MORGEN]
Rolf August Brand *In its* Tech. and Sci. Publ. 1983 1983 p 341-353 In GERMAN (For primary document see N84-26430 16-81)
(MBB-UR-602-82-O) Avail: Issuing Activity

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-26175 Institut d'Aeronomie Spatiale de Belgique, Brussels.
COUPLING BETWEEN THE THERMOSPHERE AND THE STRATOSPHERE: THE ROLE OF NITRIC OXIDE
G. Brasseur 1983 20 p refs Presented at Intern. Symp. on Ground-Based Studies of the Middle Atmosphere, Schwerin, West Germany, 9-13 May 1983
(Aeronomica-Acta-A-270-1983) Avail: Issuing Activity

Two-dimensional model calculations reveal that the chemical conditions at the stratopause are related to the state of the thermosphere. This coupling mechanism can be partly explained by the downward transport of nitric oxide during the winter season and consequently depends on the dynamical conditions in the mesosphere and in the lower thermosphere (mean circulation and waves). In summer, the photodissociation of nitric oxide plays an important role and the thermospheric NO abundance modulates the radiation field reaching the upper stratosphere. Perturbations in the nitric oxide concentration above the mesopause could therefore have an impact in the vicinity of the stratopause. Author

N84-26176# Department of Energy, Washington, D. C. Div. of Materials Sciences.
MATERIALS SCIENCES PROGRAMS, FISCAL YEAR 1983
Sep. 1983 79 p refs
(DOE/ER-0143/1) Avail: NTIS HC A05/MF A01

Measurements of atmospheric composition clearly demonstrate that the carbon dioxide concentration has increased by about 8 percent over the last 24 years (Keeling et al., 1982) and it is generally acknowledged that a major portion of the increase is related to the burning of fossil fuels. Because the growth in atmospheric CO2 appears so closely tied to CO2 emissions from fossil fuel burning and because the CO2 issue has achieved considerable environmental significance, it seemed appropriate to review the analysis of Keeling (1973). The new data and revised methods attempt to reduce the uncertainties, and appear to make major modifications in the much used data set of CO2 emissions from Rotty (1979, 1981) unnecessary. The intent of this paper is thus two-fold: (1) to provide detailed documentation for a procedure to estimate CO2 emissions from fossil fuels, and (2) to make independent and updated estimates of the rate at which fossil fuel combustion has released carbon dioxide in the atmosphere. B.W.

N84-26177# Eastern Environmental Radiation Lab., Montgomery, Ala.
ANALYTICAL CAPABILITY OF THE ENVIRONMENTAL RADIATION AMBIENT MONITORING SYSTEM
J. A. Broadway and M. Mardis Sep. 1983 74 p refs
(PB84-166818; EPA-520/5-83-024) Avail: NTIS HC A04/MF A01 CSCL 18H

The Environmental Radiation Ambient Monitoring System (ERAMS) program is composed of a network of sampling stations throughout the United States plus an associated radioanalytical and assessment support group. These components provide a capability to evaluate environmental consequences from both normal ambient concentrations of radiation and time dependent changes as measured by the samples. The program is structured to measure concentrations of radionuclides in air, milk, surface water, and drinking water and to estimate dose and health impact. Several examples of short term and long term assessments of dose and health effect calculations from the ERAMS data base are presented in this report. Author (GRA)

N84-26178# Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
EVALUATION OF PROCESS SYSTEMS FOR EFFECTIVE MANAGEMENT OF ALUMINUM FINISHING WASTEWATERS AND SLUDGES Final Report
F. Michael Saunders, Edward S. K. Chian, C. Blake Harmon, Kurt L. Kratz, Jesus M. Medero, Michael E. Pisani, Rey R. Ramirez, and Mesut Sezgin Mar. 1984 157 p refs Sponsored in part by the Aluminum Extruders Council
(Grant EPA-R-807512)
(PB84-170661; EPA-600/2-84-077) Avail: NTIS HC A08/MF A01 CSCL 13B

Innovative processes for use in treatment of wastewaters and sludges produced in anodizing, etching and painting extruded aluminum were investigated. Results of the research can be immediately implemented at many aluminum finishing plants where sludge disposal restrictions and costs are increasing. Segregated neutralization and recovery of spent caustic etch can be used to increase the net solids content of dewatered sludge available for disposal. Reclamation of dewatered sludge solids using acid extraction for production of liquid alum has potential for virtual elimination of the need for sludge disposal while producing a net income from the sludge reclamation process. Author (GRA)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-26179# Wisconsin Univ., Madison.
REMOTE MEASUREMENTS OF TROPOSPHERIC AEROSOL SCATTERING PROPERTIES BY AN AIRBORNE HIGH SPECTRAL RESOLUTION LIDAR Ph.D. Thesis
Jeffrey Thomas Sroga 1983 194 p refs
Avail: Univ. Microfilms Order No. DA8321775

The High Spectral Resolution Lidar (HSRL) measures optical properties of atmospheric aerosols by interferometrically separating the elastic aerosol backscatter from the Doppler broadened molecular signal. HSRL flight evaluation tests were conducted during the summer of 1980. Data acquired during flight evaluations were obtained under both day and night background lighting conditions with an average laser output of 2 mw. The HSRL system operation, calibration and data analysis procedures developed during these tests are described. The instrumental calibration is based upon theoretical calculations of the spectral bandpass distributions of the receiver spectrometer and the angular distribution of the backscattered light from the atmosphere. Analysis of data obtained during these flight tests is presented, including a sensitivity analysis of the measured optical properties to uncertainties in the instrumental calibration. This sensitivity analysis has shown the calibration uncertainties to be the limiting factor in the accuracy of the HSRL measurements for the evaluation flight data. Dissert. Abstr.

N84-26180 Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Munich (West Germany).

REPORT ON MEASUREMENTS OF TERRESTRIAL RADIATION IN THE SCHWANDORF AREA AND THE RADIOLOGICAL LOAD OF THE RIVER NAAB [BERICHT UEBER MESSUNGEN DER TERRESTRISCHEN STRAHLUNG IM RAUM SCHWANDORF UND DER RADIOLOGISCHEN BELASTUNG DER NAAB]

H. Behrens, K. Bunzl, B. Haider, R. Kretner, M. Lechle, W. Rauert, G. Rosner, and M. Wolf Nov. 1983 62 p refs In GERMAN (GSF-A-6/83; ISSN-0721-1694) Copyright. Avail: Issuing Activity

Measurements of gamma ray dosages in the development area are described. The natural air currents and its annual variation is determined by measurement of potential alpha energy concentrations. The radiation exposure caused by the air currents was calculated. Measurement methods and results of the radio active concentration of specific radio active nuclei in river water are described. Transl. by E.A.K.

N84-26181# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A SIMPLIFIED UPPER ATMOSPHERE MODEL TO EXPLAIN SEASONAL PHENOMENA

C. J. Zamlutti Apr. 1984 40 p refs Submitted for publication (INPE-3071-PRE/488) Avail: NTIS HC A03/MF A01

The upper atmosphere was modeled by using a system of fluid equations for each particle species. A bidimensional differential model is proposed as an alternative approach to deal with energy unbalancing dependent phenomena. The method consists of assuming a steady dynamical equilibrium of energy, along the vertical, and particle transport as relaxation mechanism, to restore the balance. Only the equation of motion needs to be considered for most of the cases. A qualitative discussion is presented which explains seasonal peculiarities of middle and high latitudes. E.A.K.

N84-26182*# California Inst. of Tech., Pasadena. Seismological Lab.

ANISOTROPIC MODELS OF THE UPPER MANTLE

Janice Regan and Dan L. Anderson 15 Nov. 1983 84 p refs (Grants NsG-7610; NSF EAR-81-15236)
(NASA-CR-173549; NAS 1.26:173549; CIT-Contrib-4015) Avail: NTIS HC A05/MF A01 CSCL 08G

Long period Rayleigh wave and Love wave dispersion data, particularly for oceanic areas, were not simultaneously satisfied by an isotropic structure. Available phase and group velocity data are inverted by a procedure which includes the effects of transverse anisotropy, an elastic dispersion, sphericity, and gravity. The resulting models, for the average Earth, average ocean and oceanic regions divided according to the age of the ocean floor, are quite different from previous results which ignore the above effects. The models show a low velocity zone with age dependent anisotropy and velocities higher than derived in previous surface wave studies. The correspondence between the anisotropy variation with age and a physical model based on flow aligned olivine is suggested. Author

N84-26183*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OBSERVATIONS OF THE EARTH'S MAGNETIC FIELD FROM THE SPACE STATION: MEASUREMENT AT HIGH AND EXTREMELY LOW ALTITUDE USING SPACE STATION-CONTROLLED FREE-FLYERS

William Webster, Jr., James J. Frawley (Science Systems and Applications, Inc.), and Michael Stefanik (Science Systems and Applications, Inc.) May 1984 52 p refs
(NASA-TM-86119; NAS 1.15:86119) Avail: NTIS HC A04/MF A01 CSCL 08N

Simulation studies established that the main (core), crustal and electrojet components of the Earth's magnetic field can be observed with greater resolution or over a longer time-base than is presently possible by using the capabilities provided by the space station. Two systems are studied. The first, a large lifetime, magnetic monitor would observe the main field and its time variation. The second, a remotely-piloted, magnetic probe would observe the crustal field at low altitude and the electrojet field in situ. The system design and the scientific performance of these systems is assessed. The advantages of the space station are reviewed. R.J.F.

N84-26184*# California Inst. of Tech., Pasadena. Seismological Lab.

LOWER MANTLE HETEROGENEITY, DYNAMIC TOPOGRAPHY AND THE GEOID

Bradford H. Hager, Robert W. Clayton, Mark A. Richards, Robert P. Comer, and Adam M. Dziewonski 25 Jun. 1984 25 p refs (Grant NAG-7610)
(NASA-CR-173621; NAS 1.26:173621) Avail: NTIS HC A02/MF A01 CSCL 08E

Density contrasts in the lower mantle, recently imaged using seismic tomography, drive convective flow which results in kilometers of dynamically maintained topography at the core-mantle boundary and at the Earth's surface. The total gravity field due to interior density contrasts and boundary topography predicts the largest wavelength components of the geoid remarkably well. Neglecting dynamic surface deformation leads to geoid anomalies of opposite sign than are observed. Author

N84-26185# Air Force Geophysics Lab., Hanscom AFB, Mass.

PROCEEDINGS OF THE AIR FORCE GEOPHYSICS LABORATORY WORKSHOP ON NATURAL CHARGING OF LARGE SPACE STRUCTURES IN NEAR EARTH POLAR ORBIT Scientific Interim Report

R. C. Sagalyn, ed., D. E. Donatelli, ed. (Boston Coll., Chestnut Hill, Mass.), and I. Michael, ed. 25 Jan. 1983 402 p refs Workshop held at Hanscom AFB, Mass., 14-15 Sep. 1982
(Contract F19628-81-K-0011)
(AD-A134894; AFGL-TR-83-0046; ERP-825) Avail: NTIS HC A18/MF A01 CSCL 04/1

The causes and effects of vehicle charging in near Earth orbit and the problems encountered in developing models or codes to adequately deal with the charged vehicle environment are reviewed. For individual titles, see N84-26186 through N84-26214.

N84-26186# California Univ., San Diego, La Jolla. Center for Astrophysics and Space Science.

AN OVERVIEW OF CHARGING OF LARGE SPACE STRUCTURES IN POLAR ORBIT

E. C. Whipple, Jr. *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 11-28 refs (For primary document see N84-26185 16-46)
(AD-P002100) Avail: NTIS HC A18/MF A01 CSCL 04/1

This paper gives an overview of some of the important questions regarding charging effects on large space structures in the polar ionosphere. The ionosphere as a rule is a rather benign environment as far as charging of spacecraft is concerned. The ionospheric plasma is relatively cool and dense in comparison with other plasmas in space. The plasma density ranges from values on the order of 1000000/cu cm down to values as low as or even below 100/cu cm, with temperatures well below 1 eV (11600 K). However, there can be large fluxes of energetic electrons in the polar ionosphere. This subject is a matter of concern because these auroral fluxes could charge a spacecraft to large potentials. Author

N84-26187# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.

IONOSPHERIC CHARACTERISTICS: A REVIEW

F. J. Rich *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 29-56 refs (For primary document see N84-26185 16-46)
(AD-P002101) Avail: NTIS HC A18/MF A01 CSCL 04/1

The ionosphere is important to spacecraft charging because the thermal ions and electrons provide a significant current to a spacecraft surface. Low, mid, and high altitude ionospheric characteristics are discussed. B.G.

N84-26188# York Univ., Downsview (Ontario). Dept. of Physics.

IS THERE A GOOD WAY TO MODEL SPACECRAFT CHARGING IN THE PRESENCE OF SPACE-CHARGE COUPLING, FLOW AND MAGNETIC FIELDS? c64

J. G. Laframboise *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 57-78 refs (For primary document see N84-26185 16-46)

(AD-P002102) Avail: NTIS HC A18/MF A01 CSCL 12/1

The development of realistic numerical simulations of spacecraft-environment interactions in low-orbit conditions appears likely to be a more difficult task than it has been in high-orbit conditions. At the same time, carefully chosen combinations of existing simulation methods show some promise of being able to cope with this situation, at least in two dimensions and possibly in three dimensions. Simple large-voltage symmetric-sheath probe theories, which have been used to provide preliminary estimates of spacecraft voltages, contain serious limitations for use in making more precise calculations. Author

N84-26189*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CHARGED PARTICLE EFFECTS ON SPACE SYSTEMS c72

W. N. Hall and N. J. Stevens *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 79-106 refs Prepared in cooperation with AFGL, Hanscom AFB, Mass. (For primary document see N84-26185 16-46)

(AD-P002103) Avail: NTIS HC A18/MF A01 CSCL 20H

There is a growing tendency to plan space missions that will incorporate very large space power systems. These space power systems must function in a space plasma environment that can impose operational limitations. As the power output increases, the operating voltage must also increase and this voltage, exposed at solar array interconnects, interacts with the local plasma. The implications of such interactions are considered here. The available laboratory data for biased array segment tests are reviewed to demonstrate the basic interactions considered. A data set for a test of a floating high voltage array illuminated in a solar simulator test is used to generate approximate relationships for positive and negative current collection from plasma. These relationships are applied to a hypothetical 100 kW power system operating in a 400 lm, near-equatorial, orbit. It is found that discharges from the negative regions of the array are the most probable limiting factor for array operation. Author

N84-26190*# Utah State Univ., Logan.

SPACE SHUTTLE CHARGING RESULTS c16

W. J. Raitt *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 107-118 (For primary document see N84-26185 16-46)

(Contract NAS5-24455)

(AD-P002104) Avail: NTIS HC A18/MF A01 CSCL 20C

The vehicle charging and potential experiment (V CAP) was accepted by NASA as part of the OSS-1 payload to be flown on a test flight of the space shuttle. The V CAP eventually flew on the third shuttle flight at the end of March, 1982. This shuttle flight, designated STS-3, flew a circular orbit with an inclination of 37 deg, an altitude of 250 km, and an orbital plane approximately dawn/dusk. The V CAP experiment consisted of four plasma diagnostic instruments, two of which were duplicated, a fast pulse electron generator (FPEG) and a digital control and interface unit. The prime objective of the V CAP experiment was to study the electrical charging of the orbiter under conditions of passive orbiting, and under conditions of active charge emission by an electron generator. These measurements were to be made under a variety of conditions, such as orientation of the B vector, ram vector, solar direction, varying ambient plasma density, and sunlit/darkness conditions. In order to better understand the mechanisms of vehicle charging, experiments were also made on the interaction of the beam with its environment. Author

N84-26191*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.

STS-3/OSS-1 PLASMA DIAGNOSTICS PACKAGE (PDP) MEASUREMENTS OF ORBITER-GENERATED V X B POTENTIALS AND ELECTROSTATIC NOISE c75

S. D. Shawhan and G. B. Murphy *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 119-123 (For primary document see N84-26185 16-46)

(Contract NAS8-32807)

(AD-P002105) Avail: NTIS HC A18/MF A01 CSCL 20I

The Plasma Diagnostics Package (PDP) was flown as part of OSS-1 pallet on the Space Shuttle fight STS-3 in March 1982. During this eight-day mission, the PDP was operated in its pallet position and on the Remote Manipulator System. PDP measurements included dc electric and magnetic fields, ac magnetic fields to 100 kHz; ac electric fields to 800 MHz and at S-band, energetic ions and electrons from 2.5 eV to 50 KeV; total electron flux; the ion mass spectrum, energy distribution, and streaming direction; the electron density and temperature, and the neutral pressure. Author

N84-26192*# Stanford Univ., Calif. Space, Telecommunications, and Radioscience Lab.

ELECTRON BEAM EXPERIMENTS AND OTHER OBSERVATIONS FROM STS-3 c72

P. M. Banks *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 125-131 ref (For primary document see N84-26185 16-46)

(Contract NAS5-24455)

(AD-P002106) Avail: NTIS HC A18/MF A01 CSCL 20H

The Vehicle Charging and Potential Experiment (V CAP) experiment was one of six major experiments flown on the OSS-1 pallet aboard STS-3 in March, 1982. The V CAP flight objectives were both scientific and technological and included studies of natural electrical charging of the Orbiter, the effects of artificial electron beam emissions on the Orbiter electrical characteristics, and measurements of plasma phenomena. To determine plasma conditions, wave phenomena associated with pulsed and dc electron beam operations, the nature of the plasma environment within the payload bay, the feasibility of making ionospheric measurements from the Orbiter, and the characteristics of vehicle return currents to different parts of the Orbiter were measured. Author

N84-26193*# Minnesota Univ., Minneapolis. School of Physics and Astronomy.

FLOATING POTENTIALS AND THE HOT PLASMA GENERATED BY AN ELECTRON-BEAM-EMITTING ROCKET IN THE IONOSPHERE c72

J. R. Winckler *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 133-140 refs (For primary document see N84-26185 16-46)

(Grant NsG-5088)

(AD-P002107) Avail: NTIS HC A18/MF A01 CSCL 20H

This paper summarizes some recent experimental results concerning the potentials of a large vehicle emitting a powerful electron beam in the ionosphere. Many such experiments have been conducted in the last decade (see Winckler 1) and these experiments indicate that if a constant electron beam is emitted in the ionosphere from a large rocket or other space vehicle, a return current may be drawn from the ionospheric plasma that will stabilize the potential of the vehicle in the range of a few tens of volts to perhaps several hundred volts. Author

N84-26194# Air Force Geophysics Lab., Hanscom AFB, Mass.

THE WORST CASE CHARGING ENVIRONMENT c18

D. A. Hardy *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 141-155 (For primary document see N84-26185 16-46)

(AD-P002108) Avail: NTIS HC A18/MF A01 CSCL 20/3

Whether a spacecraft will charge in the auroral zone is crucially dependent on the magnitude of the current to the spacecraft from the precipitating and backscattered electrons and on how that

current is distributed over the electron spectrum. To provide theorists and modelers with some initial input on these aspects of the spacecraft charging problem a survey was conducted to find examples of electron precipitation where the total integral number flux over the electron spectrum exceeded 10 to the 10th power electrons/sq cm. sec sr and the average energy of the electrons was approximately equal to or exceeded 1 keV. Author

N84-26195# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
ESTIMATES OF PRECIPITATING ELECTRON POWER FLUX FROM SIMULTANEOUS DMSP AURORAL IMAGE AND ISEE-1 AKR OBSERVATIONS c72
N. A. Saflekos and R. E. Sheehan *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 157-162 ref (For primary document see N84-26185 16-46)
(AD-P002109) Avail: NTIS HC A18/MF A01 CSCL 20/8

This report describes the first attempt to associate the area of discrete aurora observed in a DMSP image with simultaneous measurements of auroral kilometric radiation (AKR) power flux at 178 and 311 kHz. Author

N84-26196# Air Force Geophysics Lab., Hanscom AFB, Mass.
ENVIRONMENTAL INTERACTIONS OF POLAR ORBITING SATELLITES c15
W. J. Burke *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 163-173 refs (For primary document see N84-26185 16-46)
(AD-P002110) Avail: NTIS HC A18/MF A01 CSCL 22/2

Addressed are questions concerning how large, and/or high-power, polar-orbiting spacecraft will interact with auroral environments. This paper discusses some experiences of spacecraft charging, vehicle shadowing, and current leakage encountered by AFGL measuring systems on small, polar-orbiting satellites. Because spacecraft charging at ionospheric altitudes does not seriously threaten the operation of present systems this subject has not received the widespread attention given to it at geostationary altitudes. As a matter of economics it is desirable to transfer as much as possible of what we have learned about spacecraft interactions at geostationary orbit to the auroral oval. Economics must not however blind us to the real differences between the two problems. Author

N84-26197# European Space Technology Center, Noordwijk (Netherlands). Space Sciences Dept.
INTERACTIONS BETWEEN A LARGE BODY AND ITS ENVIRONMENT IN A LOW POLAR ORBIT c18
R. Grard, K. Knott, and A. Pedersen *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 175-184 refs (For primary document see N84-26185 16-46)
(AD-P002111) Avail: NTIS HC A18/MF A01 CSCL 20/3

The parameters that characterize the high latitude ionosphere are reviewed. The electron current density collected by a surface is evaluated in typical environments and is compared to the emitted flux of photoelectrons. The polarity and order of magnitude of the relative surface potentials are tentatively estimated for various situations: sunlight, shadow, and eclipse. Other types of interactions encountered by large structures, such as magnetic induction effect and plasma instability triggering, are also discussed. Author

N84-26198# University Coll., London (England). Dept. of Physics and Astronomy.
OBSERVATIONS OF DIFFERENTIAL CHARGING WITH METEOSAT c15
A. D. Johnstone and G. L. Wrenn *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 185-195 refs (For primary document see N84-26185 16-46)
(AD-P002112) Avail: NTIS HC A18/MF A01 CSCL 20/3

The behavior of the geosynchronous METEOSAT spacecraft in the Earth's shadow throws new light on the topic of the influence of secondary electron emission on differential charging, which could assist understanding of these processes in more general situations. METEOSAT F1, a geosynchronous meteorological satellite operated by the European Space Agency, suffered from a number of non-damaging operational anomalies that were attributed to electrostatic discharges caused by differential charging. The second flight model F2 was modified in several ways to reduce its susceptibility to arcing. In addition, two new sensors were included in the payload to monitor the plasma environment and to detect the electrical effects of discharges. Since launch in June 1981 the spacecraft has experienced only a few anomalies attributable to arcing and no electrostatic discharges have been detected by the monitor although that could be a matter of sensitivity. So far the only evidence for the spacecraft charging to significant potentials occurs during eclipse and comes from the plasma environment monitor. Author

N84-26199# Aerospace Corp., Los Angeles, Calif. Space Sciences Lab.
LABORATORY AND SPACE MEASUREMENTS OF MATERIALS c33
J. F. Fennell, P. F. Mizera, and M. S. Leung *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 197-213 refs (For primary document see N84-26185 16-46)
(Contract F04701-82-C-0083)
(AD-P002113) Avail: NTIS HC A18/MF A01 CSCL 09/1

The SCATHA (Spacecraft Charging at High Altitude) data has shown that several dielectric materials responded to the space environment differently than was expected prior to launch. For example, there was a marked increase in the bulk conductivity of Kapton samples that were exposed to the Sun in the space vacuum. Teflon accumulated a permanent charge, which resulted in a potential difference that increased with time between it and the satellite frame. A quartz cloth thermal control material was observed to charge to higher levels on orbit than was obtained in pre-launch laboratory tests. Some of the differences between the expected and observed data have been explained by laboratory tests that more accurately model the space environment. Author

N84-26200# IRT Corp., San Diego, Calif.
SPACE ELECTRON-INDUCED DISCHARGE COUPLING INTO SATELLITE ELECTRONICS c18
J. Wilkenfeld *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 215-234 refs (For primary document see N84-26185 16-46)
(AD-P002114) Avail: NTIS HC A18/MF A01 CSCL 20/3

The USAF and NASA began the Spacecraft Charging at High Altitude (SCATHA) program because indirect evidence indicated that discharges induced by space electrons in spacecraft dielectrics could generate sufficient electromagnetic energy to cause spacecraft malfunction or failure. The ultimate cause must be related to the coupling of energy from the discharge into circuits that then malfunction: either an upset (uncommanded change of state of electrical burnout of components) occurs. The draft of this document contains information that designers need to develop spacecraft that are resistant to electron-induced discharges. Author

N84-26201# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE INTERACTION OF LARGE SPACE STRUCTURES WITH THE NEAR-EARTH ENVIRONMENT
U. Samir *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 235-251 refs Prepared in cooperation with Michigan Univ., Ann Arbor (For primary document see N84-26185 16-46)
(AD-P002115) Avail: NTIS HC A18/MF A01 CSCL 04A

The interaction between natural plasmas and satellites orbiting the planets is one aspect of the more general problems of the interaction between collisionless plasma flows and bodies in the solar system. Examples of body plasma interactions relevant to

the solar system are given. The detailed structures, that is, the detailed particle and field distributions in space and time around the bodies, are expected to differ for different types of interactions. However, the basic patterns could be similar since the basic physical processes acting in such interactions are probably similar. Planetary magnetospheres and shocks for example are to be seen as effects whose cause is the interaction between the body (planet's intrinsic and/or induced magnetic field) and plasma (solar wind). GRA

N84-26202# Air Force Geophysics Lab., Hanscom AFB, Mass.
SHUTTLE ORBITER CHARGING IN POLAR EARTH ORBIT **c18**

A. G. Rubin and A. L. Besse *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 253-263 refs (For primary document see N84-26185 16-46)
(AD-P002116) Avail: NTIS HC A18/MF A01 CSCL 20/3

Spacecraft in polar orbit are subject to charging by the intense electron stream that comprises the aurora. Charging is computed according to the Laframboise theory of plasma probes in which the variation of sheath thickness with potential is taken into account. In this environment spacecraft charge to potentials that depend on their size. It is shown that large spacecraft charge to higher potentials than small spacecraft. The shuttle orbiter being a large spacecraft, may charge to more than 6 kV passing through an intense beam of auroral electrons. Because of the deficiency of ambient ions in the near wake region, the rear of the vehicle will have the lowest threshold auroral current for charging and will charge to the highest potential. GRA

N84-26203# Air Force Geophysics Lab., Hanscom AFB, Mass.
POTENTIAL BARRIERS AND MULTIPLE ROOTS IN SPACECRAFT CHARGING **c18**

A. L. Besse *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 267-276 refs (For primary document see N84-26185 16-46)
(AD-P002117) Avail: NTIS HC A18/MF A01 CSCL 20/3

This paper considers two phenomena that may be demonstrated with considerable rigor by computer modeling using a code such as NASCAP. The computer modeling, however, fails to give insight into the physics involved. This paper attempts to furnish such insight by use of simple barrier models and by sketching the history of multiple roots with emphasis on the necessary conditions. GRA

N84-26204# Systems Science and Software, La Jolla, Calif.
MECHANISMS THAT LIMIT POTENTIALS ON IONOSPHERIC SATELLITES **c64**

D. E. Parks and I. Katz *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 277-281 Previously announced in IAA as A84-12899 (For primary document see N84-26185 16-46)
(Contract F19628-82-C-0081)
(AD-P002118) Avail: NTIS HC A18/MF A01 CSCL 12/1

For spinning satellites with dielectric coatings it is shown that the currents of rotating charge embedded in the dielectric surface can play a role in limiting the spacecraft ground potential of an ionospheric satellite relative to the surrounding plasma. Such currents, as well as small concentrations of H(+), can account for previous discrepancies of more than a factor of 2 between measured and calculated potentials of satellites in the region of the ionosphere where O(+) is dominant. More generally, dielectric conduction can also limit the satellite potential. The importance of such small currents as result from spin and conduction stems from the extremely small ion currents impinging on the wakeside of the satellite. Finally, theoretical estimates based on a newly described constant of the motion of a particle indicate that accounting for small concentrations of H(+) remove the major discrepancy between calculated and measured currents on the wakeside of the AE-C satellite. D.E.P. (IAA)

N84-26205# Science Applications, Inc., La Jolla, Calif.
THE IMPORTANCE OF NEUTRALS, TRANSIENT EFFECTS, AND THE EARTH'S MAGNETIC FIELD ON SHEATH STRUCTURE **c75**

L. M. Linson *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 283-292 refs (For primary document see N84-26185 16-46)
(AD-P002119) Avail: NTIS HC A18/MF A01 CSCL 20/9

Several aspects of theoretical treatments of the thickness of the sheath surrounding a large structure in low Earth orbit are examined. It is suggested that the ionization of neutrals should be considered for potentials much greater than 15 V even though the mean free path for ionization in the ambient atmosphere is much greater than the structure size. The effects of an enhanced local neutral density, the trapping of electrons in the magnetic field, and modification of the sheath space charge density due to ionization are estimated to support this suggestion. The importance of time scales associated with fluctuations in auroral fluxes, motion through inhomogeneous regions at orbital velocity, the motion of ions, ionization rates, and the response of the ionosphere is emphasized in terms of demonstrating understanding of fundamental physical processes. Criteria for determining when magnetic fields cannot be neglected when estimating the sheath thickness are derived and discussed. GRA

N84-26206# York Univ., Downsview (Ontario). Center for Research in Experimental Space Sciences.
THE THRESHOLD TEMPERATURE EFFECT IN HIGH-VOLTAGE SPACECRAFT CHARGING **c18**

J. G. Laframboise and M. Kamitsuma *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 293-308 refs (For primary document see N84-26185 16-46)
(AD-P002120) Avail: NTIS HC A18/MF A01 CSCL 20/3

A property of spacecraft surface materials, the threshold temperature for high-voltage charging, is defined. A table of threshold temperatures, calculated for various spacecraft surface materials, is presented. This property explains and unifies several recently identified phenomena affecting spacecraft charging, including: the existence of multiple floating potentials for certain spacecraft surfaces in certain external environments; sensitivity effects in the numerical prediction of spacecraft potentials; sudden jumps in both observed and simulated spacecraft potentials in slowly varying environments; and observed threshold effects in high voltage charging. In addition, knowledge of the threshold temperature for proposed or existing surface materials provides a simple, effective way to evaluate their charging behavior when exposed to various space environments. GRA

N84-26207# Utah State Univ., Logan. Center for Atmospheric and Space Sciences.
MODELS OF THE IONOSPHERIC ENVIRONMENT

R. W. Schunk *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 311-319 refs (For primary document see N84-26185 16-46)
(AD-P002121) Avail: NTIS HC A18/MF A01 CSCL 04/1

During the last decade our understanding of the physical processes that control ionospheric behavior has greatly increased. As a consequence, comprehensive, large scale, quasi static models of the high latitude ionospheric are developed to describe the aurora, the E region conductivity and currents, the F region, and the polar wind. In addition, 2 D particles in a cell computer codes are developed to study the microphysics connected with auroral acceleration processes. These studies involve models of double layers and anomalous resistivity to explain auroral electron precipitation as well as models describing the stochastic acceleration of ionospheric ions by both electrostatic ion cyclotron waves and lower hybrid waves to explain ion beams and conics. GRA

N84-26208# Systems Science and Software, La Jolla, Calif.
POLAR CODE DEVELOPMENT **c61**

I. Katz, D. L. Cooke, M. J. Mandell, D. E. Parks, J. R. Lilley, J. H. Alexander, and A. G. Rubin *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 321-332 (For primary document see N84-26185 16-46)
(Contract F19628-82-C-0081)
(AD-P002122) Avail: NTIS HC A18/MF A01 CSCL 09/2

Possible charging of large space structures in polar orbit is examined analytically for simple spherical objects. The major questions of the probability of such events and the magnitude of charging given a particular vehicle in a specified auroral flux remain unanswered. The POLAR code is being developed to address the latter question. This paper outlines the physical models being incorporated in the program and the status of the code development. The phenomena of charging may be divided into three processes: (1) the accumulation of charge on the object resulting from collection of charged particles from the space environment; (2) the resultant change in overall and differential potentials on the vehicle; and (3) the formation of a sheath and wake due to the presence of charged objects. GRA

N84-26209*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH VOLTAGE SOLAR ARRAY MODELS AND SHUTTLE TILE CHARGING c61
A. Rubin and N. J. Stevens *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 333-336 Prepared in cooperation with AFGL, Hanscom AFB, Mass. (For primary document see N84-26185 16-46)
(AD-P002123) Avail: NTIS HC A18/MF A01 CSCL 09B

This paper described NASCAP/LEO (NASA Charging Analyzer Program/Low Earth Orbit) a 3-D computer code that simulates the interaction of space plasma with high-voltage solar arrays in the thin plasma sheath regime. The code requires information about the object and the ambient plasma. The geometric description, the material composition and the voltage distribution versus time of a solar array are the data required about the object. The plasma properties needed are the composition, density, and temperature. NASCAP/LEO will then provide the time-dependent current to each element of area of the array from the external plasma. The NASCAP/LEO output is provided in both three dimensional computer graphics and in numerical form. NASCAP/LEO is user oriented and will provide potential distributions around the object, the currents to each of the conductors, and graphical details of the sheaths and particle trajectories. GRA

N84-26210*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SHEATH SHAPES: A 3-D GENERALIZATION OF THE CHILD-LANGMUIR SHEATH MODEL FOR LARGE HIGH-VOLTAGE SPACE STRUCTURES IN DENSE PLASMAS c64
L. W. Parker, E. G. Holeman, and J. E. McCoy *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 337-389 refs Prepared in cooperation with Parker (Lee W.), Inc., Concord, Mass. (For primary document see N84-26185 16-46)
(AD-P002124) Avail: NTIS HC A18/MF A01 CSCL 12A

A new approach to computing sheaths of large high voltage space structures in dense Low Earth Orbit/Polar Earth Orbit plasmas is described. The method solves the Poisson equation numerically, using a flexible finite element mesh that allows sheath shapes to be described through an extension of the Child Langmuir Blodgett 1D sheath model to three dimensions. Space charge is computed by following trajectories. This approach is potentially more efficient for 3D sheath and wake problems than other approaches presently available. GRA

N84-26211# Air Force Geophysics Lab., Hanscom AFB, Mass.
SPACE SYSTEMS ENVIRONMENTAL INTERACTIONS TECHNOLOGY PROGRAM c12
C. P. Pike, D. A. Guidice, R. A. Davis, A. L. Chesley, W. N. Hall, and B. M. Shuman *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 391-398 (For primary document see N84-26185 16-46)
(AD-P002125) Avail: NTIS HC A18/MF A01 CSCL 22/1

The technology program described here addresses space environmental interactions on large dimension high power satellites to provide technology solutions that will insure against potential system failure. Topics under investigation include auroral plasma interaction with high voltage solar arrays, effects of polar magnetic fields on large space structures, electromagnetic interference with space communications and surveillance, and systems failures during extravehicular activity that threaten the astronaut. GRA

N84-26212# Aerospace Corp., Los Angeles, Calif. Space Sciences Lab.
SUMMARY OF EXPERIMENTAL RESULTS c18
J. F. Fennell *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 399-405 (For primary document see N84-26185 16-46)
(Contract F04701-82-C-0083)
(AD-P002126) Avail: NTIS HC A18/MF A01 CSCL 20/3

This session on experimental results provided both a review of satellite charging and laboratory results plus a discussion of new data with emphasis on the recent shuttle test flights. This panel provided, in essence, the type of basic input data required for modeling efforts. Most of the results were new to the modeling community and some of them are not understood even at a rudimentary level at this point. Some results require only changes in data bases of existing models. Discussions covered materials charging, vehicle charging effects, optical observation of electron beams from the space shuttle bay, beam/plasma interactions, electronic circuit damage, and differential charging and noise generation. GRA

N84-26213# Air Force Geophysics Lab., Hanscom AFB, Mass.
QUESTIONS THAT NEED TO BE ANSWERED c18
H. A. Cohan *In its* Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 403-405 (For primary document see N84-26185 16-46)
(AD-P002127) Avail: NTIS HC A18/MF A01 CSCL 20/3

By using the space charge limited flow theory large vehicles in a low polar orbit can charge to high potentials due to auroral energetic electrons. The implications of high potentials on spacecraft are serious. A series of questions are presented about large potentials on spacecraft in low polar orbit. Topics include large space vehicle charging, plasma/surface interactions, time scales for large differential charging, arcing from large dielectric surfaces, and resource allocation for continued research. GRA

N84-26214# Boston Coll., Chestnut Hill, Mass.
REQUIREMENTS FOR VALIDATING SYSTEM MODELS c61
M. S. Gussenhoven *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 407-415 refs (For primary document see N84-26185 16-46)
(Contracts F19628-82-K-0011; F19628-81-K-0032)
(AD-P002128) Avail: NTIS HC A18/MF A01 CSCL 09/2

An analogy is made between the development and presentation of analytic scientific theory and that of computer models in order to suggest that there are additional requirements to be made on computer models to test their validity. These constraints include code development, testing over the entire range of variables, refinement of the scope of the model, and access to measurable or testable internal outputs. GRA

N84-26215*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
A LABORATORY INVESTIGATION OF THE HIGH-FREQUENCY FARLEY-BUNEMAN INSTABILITY Progress Report
B. Kustom, N. DAngelo, and R. L. Merlino Apr. 1984 32 p
(Grant NGL-16-001-043; Contract N00014-83-K-0452)
(NASA-CR-173435; NAS 1.26:173435; AD-A140175;
U-OF-IOWA-84-8) Avail: NTIS HC A03/MF A01 CSCL 04A

A laboratory investigation of the high-frequency Farley-

Buneman instability is described. The instability was studied theoretically and is predicted to occur in the low E region of the ionosphere when the E/B drift velocity of the electrons relative to the ions is several times Cs, the ion-acoustic speed. In our experiments, an increase of the electric field well above the Lee threshold merely enhances the general power level of the fluctuations but does not effect appreciably their spectral shape. The observed frequency spectra fall-off in all cases very rapidly with increasing frequency, with a spectral shape of the type P(f) alpha 1f to the 3.5 power. This result has negative implications for a recently proposed mechanism of anomalous wave electron heating in the lower E region of the ionosphere. GRA

N84-26216# Hebrew Univ., Jerusalem (Israel). Dept. of Atmospheric Sciences.
THE ORIENTATION DISTRIBUTION ON NONSPHERICAL AEROSOL PARTICLES WITHIN A CLOUD Technical Interim Report, Dec. 1983 - Mar. 1984
I. Gallily Mar. 1984 12 p
(Contract DAJA45-83-C-0004; DA Proj. 1T1-61102-BH-57)
(AD-A140470) Avail: NTIS HC A02/MF A01 CSCL 04/1

The orientation distribution function of fibrous and platelet-like aerosol particles was calculated for a general laminar flow by solving the Fokker-Planck equation. It has been found that this function shows mazima and minima, which indicates a preferred orientation. The cases of a point source and a laminar jet are brought out as an example. Author (GRA)

N84-26217# Boston Univ., Mass. Dept. of Astronomy.
A STUDY OF GEOMAGNETIC PULSATIONS USING THE AFGL (AIR FORCE GEOPHYSICS LABORATORY) MAGNETOMETER NETWORK Final Report, 15 Nov. 1980 - 14 Nov. 1983
W. J. Hughes, H. J. Singer, and M. Lester 13 Jan. 1983 56 p
(Contract F19628-81-K-0003; AF Proj. 7601)
(AD-A140507; AFGL-TR-84-0027) Avail: NTIS HC A04/MF A01 CSCL 08/14

The objective of this work has been to study the midlatitude magnetic signatures of magnetospheric substorm onsets with the aim of using these signals to time and locate substorm onsets. The primary data source was the AFGL Magnetometer Network, a unique facility in that it spans over four hours in local magnetic time, a far greater extent than any other high-time-resolution network. Using this capability we have found that pi2 pulsation polarizations are ordered in longitude or local time. The direction of the major axis of the polarizations ellipse varies with longitude, and points due north on the central meridian of the D.C. substorm current system. We have made use of this pattern to locate particular substorms. We have also shown that substorm onset signatures near geostationary orbit are far more localized than at midlatitudes on the ground. The geostationary orbit signature is usually localized to within the two meridians on which the main substorm field-aligned currents flow, whereas the ground signature is usually seen over the entire nightside of the Earth. The latter we have shown by using data from Northern Europe in conjunction with the AFGL data. In addition to these studies, we have also made some theoretical contributions and participated in two data analysis. GRA

N84-26218# Keo Consultants, Brookline, Mass.
OPTICAL IONOSPHERIC MAPPING Final Report, 28 Jul. 1980 - 30 Sep. 1983
R. H. Eather 15 Dec. 1983 28 p
(Contract F19628-80-C-0153; AF Proj. 4643)
(AD-A140508; AFGL-TR-83-0325) Avail: NTIS HC A03/MF A01 CSCL 04/1

This report describes the support services provided by Keo Consultants to the operation and improvement of the All Sky Imaging Photometer on the NKC135 Airborne Ionospheric Observatory. It describes two new intensified camera systems constructed for the ground-based support of the airborne measurements and gives examples of the data obtained. GRA

N84-26219# Lowell Univ., Mass. Center for Atmospheric Research.
A HIGH FREQUENCY RADIO TECHNIQUE FOR MEASURING PLASMA DRIFTS IN THE IONOSPHERE
C. G. Dozois Jul. 1983 260 p
(Contract F19628-80-C-0064; AF Proj. 4643)
(AD-A140509; ULRF-424/CAR; AFGL-TR-83-0202; SR-6) Avail: NTIS HC A12/MF A01 CSCL 04/1

A technique is developed for investigating the dynamics of the auroral ionosphere through the interpretation of high-frequency radio-wave observations made at Goose Bay, Labrador. Spectral analysis of ionospheric reflections received at four spaced antennas identifies each echo by its Doppler shift, making it possible to locate several simultaneous reflection points with a limited antenna array. The radial velocity components of the reflection areas are determined from the Doppler shifts, and a resultant plasma-drift velocity is calculated from these components. The analysis technique is first tested with computer-simulated drift data; then calculations using Goose Bay data from night observations of the F region verify the technique by showing a westerly drift in late evening, shifting to an easterly drift around midnight, in agreement with F-region drift measurements made by other observational techniques. GRA

N84-26220# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Atmospheric Transport and Chemical Transformation Acid Precipitation.
ACID DEPOSITION: ATMOSPHERIC PROCESSES IN EASTERN NORTH AMERICA, A REVIEW OF CURRENT SCIENTIFIC UNDERSTANDING
1983 381 p refs Sponsored in part by Carnegie Corp. and Charles Culpepper Foundation, Inc. and Andrew W. Mellon Foundation and Alfred P. Sloan Foundation
(PB84-173095; ISBN-0-309-03389-6; LC-83-61851) Avail: NTIS HC A17/MF A01 CSCL 04A

There is no observational evidence of a strong nonlinearity in the relationship between annual average total emissions and total deposition of sulfur in eastern North America. The finding is supported by theoretical calculations using the best available laboratory measurements of photochemical rate parameters. Currently available models of long range atmospheric transport and transformation are not sufficiently developed to assess relationships between emissions from specific sources and deposition at specific receptor sites with high reliability. GRA

N84-26221# California Univ., San Diego.
EXPERIMENTAL TEST OF THE GRAVITATIONAL INVERSE SQUARE LAW BETWEEN 45 CENTIMETERS AND ONE METER Ph.D. Thesis
Peter V. Czipott 1983 170 p
Avail: Univ. Microfilms Order No. DA8405201

A superconducting gravimeter was used in a laboratory physics problem for the first time in the inverse square law of gravitation. The gravimeter test mass was used to measure the force exerted by a 325 kg source mass as a function of the separation between the masses. The results of the experiment are interpreted in terms of two models of non-Newtonian gravity, and compared to limits established by previous experiments. A statistically significant deviation at the level of 7.5 parts in 10 to the 3rd power from Newtonian behavior is observed. It does not conform to either of the non-Newtonian models. A diagnostic experiment, to test for a change in the force at a fixed distance upon the interposition of another mass, demonstrated that the errors were due to uncontrolled variations in the gravimeter tilt. When the tilt was controlled, the same diagnostic experiment yielded a null result at the level of 1.8 parts in 10 to the 4th power which is the resolution to be expected from a repetition of the inverse square law test. Suggestions for other refinements in the experiment are made. Dissert. Abstr.

N84-26222# Johns Hopkins Univ., Baltimore, Md.
MORNING TWILIGHT OBSERVATIONS OF THE ZODIACAL LIGHT AND TERRESTRIAL AIRGLOW Ph.D. Thesis

Richard Paul Cebula 1984 238 p
Avail: Univ. Microfilms Order No. DA8403078

Rocket borne ultraviolet spectroscopy of the zodiacal light and terrestrial airglow is carried out at 25A resolution during morning twilight at an altitude of between 90 and 246 km. Spectra of the zodiacal light in the wavelength region are presented. Longward of 2600A the observed spectra approximately match the spectrum of the Sun. A weak upper limit on the zodiacal light brightness is obtained. This upper limit is a factor of 10 smaller than previously reported values, but still allows for a marked increase in the albedo of the zodiacal dust cloud at 1800A. Data obtained at two viewing geometries indicate the dependence of zodiacal light brightness on elongation is the same in the ultraviolet as in the visible. Nitric oxide gamma and delta bands are observed in the region of 1900 to 2800A. Observations of the forbidden transition of simply ionized atomic oxygen at 2470A are presented. The models are shown to reproduce the observed emission profiles to within the experimental uncertainty.
Dissert. Abstr.

N84-26223# State Univ. of New York, Albany.
EFFECT OF ASYMMETRIC EKMAN DISSIPATION ON FINITE-AMPLITUDE BAROCLINIC DISTURBANCE Ph.D. Thesis
Shih-Hung Chou 1983 130 p
Avail: Univ. Microfilms Order No. DA8404420

The finite amplitude dynamics of an unstable baroclinic wave are examined in the presence of unequal Ekman pumping between the upper and lower horizontal boundaries. A total of seven cases, corresponding to different combinations of dissipation strength, are investigated. When the dissipation at both boundaries is negligibly small, the wave enters a perpetual vacillation whose amplitude and period depend on the initial conditions. In a free surface configuration, when the bottom Ekman pumping is strong, the life cycle of the wave amplitude is characterized by a growth stage to a maximum amplitude followed by a decay stage. If the initial amplitude is less than a certain critical value, the equilibrated state becomes totally wave free; otherwise it contains a finite amplitude wave which has lost its vertical phase tilt. When Ekman pumping is weak, a relatively short period damped vacillation develops on the long period growth decay pattern. Dissert. Abstr.

N84-26224# Princeton Univ., N. J.
BAROTROPIC STUDIES OF STATIONARY EXTRATROPICAL ANOMALIES IN THE TROPOSPHERE Ph.D. Thesis
James Lucas Kinter 1983 192 p
Avail: Univ. Microfilms Order No. DA8405117

The steady, linear barotropic vorticity equation on a sphere and the time dependent, nonlinear shallow water equations on a sphere are solved semispectrally and spectrally, respectively, with various forms of forcing to examine the similarity between the barotropic response to such forcing and observed stationary anomalies in the upper troposphere. The forcing terms are included to model the effect of the Earth's orography, transient eddies and tropical heat sources on the tropospheric circulation. The solutions indicate that orographically forced, stationary Rossby waves are sensitive to the zonal wind both in scale and in propagation characteristics. The scale of the waves is inversely proportional to the magnitude of the zonal wind, and the variations of the zonal wind with latitude produce changes in the ray paths along which the waves are manifested. Nonlinear interactions among these waves and transient waves act to alter the amplitude of the stationary waves much more than the scale or phase of the waves.
Dissert. Abstr.

N84-26225# Princeton Univ., N. J.
ON THE STRUCTURE AND FORCING OF TROPOSPHERIC STATIONARY WAVES Ph.D. Thesis
Sumant Nigam 1984 226 p
Avail: Univ. Microfilms Order No. DA8405126

The structure and forcing of the winter time tropospheric stationary waves is investigated. The influence of the Rossby wave critical latitude (CL) on the topographically forced stationary wave structure is evaluated through linear and quasilinear calculations using a high resolution spherical barotropic model. The zonal mean absolute vorticity gradient computed in the winter upper troposphere (300 mb) from the monthly mean global circulation data shows the presence of an S shaped kink near CL similar to the one produced in the quasilinear calculations. A steady linear primitive equation model having nine layers in the vertical is used to understand the structure and forcing of the winter time tropospheric stationary waves. Transient eddies and stationary nonlinearities play only a secondary role in the mid-latitude upper tropospheric stationary wave dynamics but are quite important in the lower troposphere and in the tropics. The topographically forced component is found to be much larger than the thermally forced component.
Dissert. Abstr.

N84-26259# South Carolina Univ., Columbia. Dept. ot Geology.
FOURIER SHAPE ANALYSIS: A MULTIVARIATE PATTERN RECOGNITION APPROACH
R. Ehrlich and W. E. Full *In* Naval Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Maringe Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 47-67 Prepared in cooperation with Wichita State Univ., Kan. (For primary document see N84-26257 16-48)
(AD-P003118) Avail: NTIS HC A13/MF A01 CSCL 12/1

N84-26511*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
PATTERNS OF MAGNETIC FIELD MERGING SITES ON THE MAGNETOPAUSE
J. G. Luhmann, R. J. Walker, C. T. Russell, N. U. Crooker, J. R. Spreiter (Stanford Univ.), and Stephen S. Stahara (Neilsen Eng. and Res., Inc.) *In* Neilsen Eng. and Res., Inc. Appl. of a Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 10p (For primary document see N84-26509 16-88)
Avail: NTIS HC A08/MF A01 CSCL 04A

N84-26513*# California Univ., Los Angeles. Dept. of Atmospheric Sciences.
MAGNETOPAUSE MERGING SITE ASYMMETRIES
N. U. Crooker, J. G. Luhmann, J. R. Spreiter (Stanford Univ.), and Stephen S. Stahara (R. M. Assoc., Inc.) *In* Neilsen Eng. and Res., Inc. Appl. of A Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 23p refs (For primary document see N84-26509 16-88)
(Grants NsG-5351; NSF ATM-82-10691)
Avail: NTIS HC A08/MF A01 CSCL 04A

N84-26514*# California Univ., Los Angeles. Dept. of Atmospheric Sciences.
MAGNETIC FIELD DRAPING AGAINST THE DAYSIDE MAGNETOPAUSE
N. U. Crooker, J. G. Luhmann, C. T. Russell, E. J. Smith (JPL), J. R. Spreiter (Stanford Univ.), and Stephen S. Stahara (R. M. Assoc., Inc.) *In* Neilsen Eng. and Res., Inc. Appl. of A Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 18p refs (For primary document see N84-26509 16-88)
(Grants NsG-5351; NSF ATM-82-10691)
Avail: NTIS HC A08/MF A01 CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-26226 Institut d'Aeronomie Spatiale de Belgique, Brussels.
SELF-OSCILLATIONS AND PREDICTABILITY IN CLIMATE DYNAMICS
C. Nicolis 1984 34 p refs Submitted for publication
(Contract EEC-CLI-027-B(G))
(Aeronomica-Acta-A-278-1984) Avail: Issuing Activity

A class of nonlinear climatic models giving rise to sustained oscillations is considered. The evolution equations are cast into a normal form which allows one to distinguish between two different types of quantities: a radial variable, which obeys a closed equation

and has strong stability properties; and a phase variable which is extremely labile. It is shown that as a result of these peculiar stability properties, the disturbances or random fluctuations acting on the system tend to deregulate the oscillatory behavior. It is concluded that such a phenomenon is a basic reason for progressive loss of predictability. Author

N84-26227# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PROTECTING WIND ACCESS: A PRELIMINARY ASSESSMENT
R. J. Noun Jun. 1983 12 p refs Presented at the Energy Sources Technol. Conf. and Exhibition, Houston, 31 Jan. - 3 Feb. 1983
(Contract EG-77-C-01-4042)
(DE83-011970; SERI/TP-211-1900) Avail: NTIS HC A02/MF A01

Wind energy systems cannot operate effectively without access to wind. The need to protect wind access is a growing source of concern to prospective investors in wind systems. Methods to protect wind access which can be used by present and future wind energy developers are presented. Two approaches were examined: (1) private, such as by negotiation of an agreement between adjacent landowners, and (2) public, such as by legislative action to protect wind access. The examination of wind access is limited to moderate and large wind energy systems, namely 30 kW to 4 MW rated capacity wind farms. R.S.F.

N84-26228# Department of Energy, Washington, D. C. Carbon Dioxide Research Div.
THE CARBON DIOXIDE RESEARCH PLAN, A SUMMARY
Nov. 1983 39 p refs
(DOE/ER-0178) Avail: NTIS HC A03/MF A01

The primary research efforts of the Carbon Dioxide Research Program and its relation to estimates of future fossil are reviewed. Program areas include the carbon cycle, climatic effects of increased atmospheric CO2 concentrations, the response of vegetation and agricultural crops to increased levels of CO2 in the atmosphere, and the indirect effects of CO2 induced climate changes and vegetation responses. These indirect effects include human health, agriculture, managed forests, water resources, and fisheries. R.S.F.

N84-26229# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ON THE 1983 DROUGHT IN NORTHEAST BRAZIL
V. Brahmananda Rao and Jose Ivaldo B. deBrito May 1984 13 p refs
(INPE-3110-PRE/509) Avail: NTIS HC A02/MF A01

The rainfall data for Northeast Brazil which showed that the drought of 1983 was extensive are examined. In the interior dry region the rainfall during the rainy season of 1983 was less than 40% of the normal. It is shown that the drought was the worst in the past 20 years. Rainfall anomalies over NE Brazil are related to the Southern Oscillation. Variations in the Southern Oscillation index preceded the corresponding rainfall anomalies by about 2 months. It is suggested that the Southern Oscillation index has predictive value. E.A.K.

N84-26230# Meteorological Satellite Center, Tokyo (Japan).
GMS OBSERVATIONS OF TYPHOON 8305(ABBY) AND HEAVY RAINFALL OF EASTERN JAPAN
Mar. 1984 151 p In JAPANESE; ENGLISH summary
(ISSN-0388-9653) Avail: NTIS HC A08/MF A01

The entire history of one of the most violent storms of the year as observed by geostationary meteorological satellite Himawari-2 is presented for the use of weather forecasters and the researchers of such weather systems. The storms featured are the long lived strong Typhoon 8305 and associated heavy rainfall occurred mainly over eastern Japan. Also included is the history of severe tropical storm 8306 which spawned at the eastern periphery of mature Typhoon 8305 circulation. The data included are Visible (VIS) and Infrared (IR) cloud imageries, enhanced IR imageries and cloud tracked wind vectors (upper level only), and Dvorak's enhanced IR imageries and T sub BB (equivalent black body temperature) grid point value maps. R.J.F.

N84-26231# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE MANAGEMENT OF ATMOSPHERIC RESOURCES IN FOOD PRODUCTION
Fausto Carlos deAlmeida May 1984 7 p refs Presented at the Climate Conf. for Latin Am. and the Caribbean, Paipa, Colombia, 28 Nov. - 3 Dec. 1983
(INPE-3121-PRE/514) Avail: NTIS HC A02/MF A01

The management of atmosphere resources in food production was examined. Topics discussed include: (1) the problem of food production and supply; (2) control of the problem; (3) workable solutions to the food shortage epidemic; and (4) recognition on a worldwide scale, the real influence and widespread consequences of weather and climate, on food production. E.A.K.

N84-26232*# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
SATELLITE OBSERVATIONS OF A MONSOON DEPRESSION Final Report
Charles Warner Jun. 1984 103 p refs
(Grant NAG5-297)
(NASA-CR-173590; NAS 1.26:173590) Avail: NTIS HC A06/MF A01 CSCL 04B

The exploration of a monsoon depression over Burma and the Bay of Bengal is discussed. Aircraft and satellite data were examined, with an emphasis on the Microwave Sounding Unit (MSU) aboard TIROS-N and the Scanning Multichannel Microwave Radiometer (SMMR) aboard Nimbus-7. The structure of the monsoon depression was found to be dominated by cumulus convection. The only systematic large scale behavior discerned was a propagation of the depression westward, and diurnal migration of contours of brightness temperature. These contours in the middle troposphere showed a gradient toward the north with the patterns migrating northward at night. From SMMR and dropwindsonde data, water vapor contents were found to be near 65 mm, increasing to more than 70 mm in the northeast Bay of Bengal. Cloud water contents reached about three mm. Rainfall rates exceeding 5.7 mm/h occurred over a small part of the storm area, while mean rainfall rates in areas of order 20,000 sq km reached approximately 0.5 mm/h. Measured MSU brightness temperatures were reconciled very well with dropwindsonde data and with airborne in situ observations of clouds (by photography) and hydrometeors (by radar). Diffuse scattering was determined to be important in computing brightness temperature. R.S.F.

N84-26233*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NIMBUS 7 SMMR DERIVED SEASONAL VARIATIONS IN THE WATER VAPOR, LIQUID WATER AND SURFACE WINDS OVER THE GLOBAL OCEANS
Cuddapah Prabhakara and David A. Short Apr. 1984 52 p refs
(NASA-TM-86080; NAS 1.15:86080) Avail: NTIS HC A04/MF A01 CSCL 04B

Monthly mean distributions of water vapor and liquid water contained in a vertical column of the atmosphere and the surface wind speed were derived from Nimbus Scanning Multichannel Microwave Radiometer (SMMR) observations over the global oceans for the period November 1978 to November 1979. The remote sensing techniques used to estimate these parameters from SMMR are presented to reveal the limitations, accuracies, and applicability of the satellite-derived information for climate studies. On a time scale of the order of a month, the distribution of atmospheric water vapor over the oceans is controlled by the sea surface temperature and the large scale atmospheric circulation. The monthly mean distribution of liquid water content in the atmosphere over the oceans closely reflects the precipitation patterns associated with the convectively and baroclinically active regions. Together with the remotely sensed surface wind speed that is causing the sea surface stress, the data collected reveal

the manner in which the ocean-atmosphere system is operating. Prominent differences in the water vapor patterns from one year to the next, or from month to month, are associated with anomalies in the wind and geopotential height fields. In association with such circulation anomalies the precipitation patterns deduced from the meteorological network over adjacent continents also reveal anomalous distributions. Author

N84-26234*# Maryland Univ., College Park. Dept. of Meteorology.
LAND-SURFACE INFLUENCES ON WEATHER AND CLIMATE Final Scientific Report
Ferdinand Baer and Yale Mintz Jun. 1984 182 p refs
(Contract NAS5-26)
(NASA-CR-173595; NAS 1.26:173595) Avail: NTIS HC A08/MF A01 CSCL 04B

Land-surface influences on weather and climate are reviewed. The interrelationship of vegetation, evapotranspiration, atmospheric circulation, and climate is discussed. Global precipitation, soil moisture, the seasonal water cycle, heat transfer, and atmospheric temperature are among the parameters considered in the context of a general biosphere model. R.S.F.

N84-26235# Wisconsin Univ., Milwaukee. Dept. of Geological/Geophysical Sciences.
DIAGNOSTICS OF RAINFALL ANOMALIES IN THE NORDESTE DURING THE GLOBAL WEATHER EXPERIMENT Semiannual Progress Report
D. N. Sikdar [1983] 9 p refs
(SAPR-1) Avail: NTIS HC A02/MF A01

The rainy season of Northeast Brazil (hereafter called Nordeste) is narrowly centered around March/April and is related to the southern most seasonal migration of the lower tropospheric confluence axis over the adjacent eastern tropical Atlantic. Knowledge of the influences of tropospheric circulations on drought/flood phenomena over the Nordeste is incomplete, mainly due to lack of adequate observations. This gap was narrowed by the special observing systems taken during the operational phase of the Global Weather Experiment. The behavior of the atmosphere-ocean system in the tropics in relation to extremely low rainfall events observed in Nordeste during 1979 are investigated. The observational basis includes the FGGE level IIIb data set, satellite images from SMS/GOES, sea surface temperature data from the FGGE level IIb and rainfall records over land. The relationship of the daily variability of large-scale pressure, cloudiness and upper level wind patterns over the Brazil-Atlantic sector during March/April 1979 to rain fall anomalies in northern Nordeste were examined. B.G.

N84-26236# Royal Netherlands Meteorological Inst., De Bilt. Centrale Weerdienst.
METEOROLOGIC REPORT BASED ON THE WORK OF OOSTERSCHELDEWERKEN [METEOROLOGISCH BEGELEIDING VAN DE OOSTERSCHELDEWERKEN]
A. W. Donker 1984 27 p In DUTCH Presented at the Symp. on Meetsystemen ten Behoeve van de Oosterscheldewerken. D1. 1: Hyro/Meteorol. Informaties S-Gravenhage, Netherlands, 27 Oct. 1983
(KNMI-TR-45) Avail: NTIS HC A03/MF A01

The close off of the Oosteschelde gave new dimensions to the meteorological information service. A regional measuring and processing system was initiated. A new approach was the hydrometeorological center, which is a combined hydrological and meteorological related forecasting system. Daily meteorological parameters are outlined. E.A.K.

N84-26237# Battelle Inst., Frankfurt am Main (West Germany).
APPLICATIONS OF LASER FOR CLIMATOLOGY AND ATMOSPHERIC RESEARCH
M. Endemann, ed. Paris ESA Oct. 1983 367 p refs
(Contract ESTEC-4868/81/NL-HP(SC))
(BLeV-R-65.169-5; ESA-CR(P)-1868) Avail: NTIS HC A16/MF A01

Sensor parameters, specific applications, and conceptual design studies are examined for various Light Detection And Ranging (LIDAR) systems as they effect climatology and general meteorological research. Atmospheric measurements are subjected to error analysis and comparison with passive radiometric data from satellite and ground based stations. The instrument classes are used to investigate such phenomena as planetary and surface albedo, cloud height, atmospheric composition, wind and temperature profiles, and sea surface temperature. For individual titles, see N84-26238 through N84-26240.

N84-26238# Battelle Inst., Frankfurt am Main (West Germany).
FUNDAMENTALS OF SPACEBORNE REMOTE SENSING: APPLICATIONS OF LASERS, VOLUME 1 c43
M. Endemann *In its* Appl. of Laser for Climatol. and Atmospheric Res. Oct. 1983 149 p refs (For primary document see N84-26237 16-47)
(Contract ESTEC-4868/81/NL/HP(SC))
Avail: NTIS HC A16/MF A01

The measurement capabilities of spaceborne, laser based sensors are examined. After a review of the interactions with light and the atmosphere, performance capabilities of Light Detection And Ranging (LIDAR) systems are discussed with emphasis on atmospheric modeling and definition of the system limitations. The feasibility of spaceborne atmospheric probing with LIDAR systems is determined and an error analysis performed on a Differential Absorption Lidar (DIAL) system. Atmospheric measurements that concern climatology research are compared for the two systems. M.A.C.

N84-26239# Kiel Univ. (West Germany).
QUANTITIES OF INTEREST TO CLIMATOLOGY AND ATMOSPHERIC PHYSICS, VOLUME 2
H. Grassl, K. Labitzke (Freie Univ.), and H. Quenzel (Technische Univ., Munich) *In* Battelle Inst. Appl. of Laser for Climatol. and Atmospheric Res. Oct. 1983 101 p refs (For primary document see N84-26237 16-47)
(Contract ESTEC-4868/81/NL-HP(SC))
Avail: NTIS HC A16/MF A01

The accuracy of data collected from spaceborne Light Detection And Ranging (LIDAR) system is discussed as it effects the understanding of the atmosphere and the climate system. Topics such as temperature and wind profiles, planetary and surface albedo, sea surface temperature, and cloud studies are examined and compared with data from ground based stations and passive satellite radiometry. M.A.C.

N84-26240# Battelle Inst., Frankfurt am Main (West Germany).
DEFINITION AND DESIGN OF SPACEBORNE LIDAR INSTRUMENTS c35
M. Endemann *In its* Appl. of Laser for Climatol. and Atmospheric Res. Oct. 1983 114 p refs (For primary document see N84-26237 16-47)
(Contract ESTEC-4868/81/NL-HP(SC))
Avail: NTIS HC A16/MF A01

The conceptual design of several different spaceborne laser sensors useful in climatology and meteorology is defined and discussed. The advantages of the backscattering and Differential Absorption Lidar (DIAL) systems are examined. Sensor parameters such as horizontal and vertical resolution, preferred wavelength, and appropriate data requirements are evaluated for cloud top height, atmospheric aerosals, wind velocity, humidity, and DIAL temperature and pressure profiles. M.A.C.

N84-26241# Technische Univ., Hanover (West Germany). Inst. fuer Meteorologie und Klimatologie.
METEOROLOGICAL MEASUREMENTS IN THE NORTHERN GERMAN COASTAL AREA FOR WIND ENERGY PROSPECTION Final Report, Dec. 1982
Gerd Tetzlaff, Sabine Theunert, Axel Hoff, Heidrun Laude, Hans-Juergen Belitz, and Reinhardt Beyer Bonn Bundeministerium fuer Forschung und Technologie Jan. 1984 221 p refs In GERMAN; ENGLISH summary Sponsored by Bundeministerium

fuer Forschung und Technologie
(BMFT-FB-T-84-017; ISSN-0340-7608) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38,50

Wind speed and direction were measured for the period from April 1979 to February 1982. The wind sensors were mounted at the towers up to a maximum height of 46 m at six different sites in the northern German coastal area. The raw data were checked, converted to physical units and corrected if necessary. The data in final form are organized in a data bank with easy access. The results for the measuring period were compared to long term geostrophic wind data and then matched. To interpolate horizontally and vertically analytical, statistical and numerical methods were applied. The wind data then served to compute the wind power potential and the energy yield of a wind energy converter (GROWIAN). The wind forecast accuracy and the spacing of wind energy converters were estimated in addition to the data evaluation. Author

N84-26242# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). SCHWAEBISCH HALL WEST GERMANY Final Report
25 Jan. 1984 375 p
(AD-A140242; AD-E850611; USAFETAC/DS-84/004) Avail: NTIS HC A16/MF A01 CSCL 04/2

This report is similar to a Revised Uniform Summary of Surface Weather Observations (RUSSWO) except the summary generated is from data observed at limited-duty observation sites. This summary is blocked based on the normal hours of observation and only those tables using hourly data are presented. Caution must be exercised when using these summaries as the data reflect conditions occurring only during limited duty hours of operation. This report is a five-part statistical summary of surface weather observations for Schwaebisch Hall. It contains the following parts: (A)Weather conditions; (C) Surface winds; (D) Ceiling versus visibility; (E) Psychrometric summaries (psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (F) Pressure summary (means, standard deviations and observation counts of station and/or sea-level pressure). Summaries in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables. GRA

N84-26243# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS). BAD KREUZNACH, GERMANY (WEST) Final Report
23 Jan. 1984 190 p
(AD-A140243; AD-E850612; USAFETAC/DS-84/003) Avail: NTIS HC A09/MF A01 CSCL 04/2

This report is similar to a Revised Uniform Summary of Surface Weather Observations (RUSSWO) except the summary generated is from data observed at limited-duty observation sites. This summary is blocked based on the normal hours of observation and only those tables using hourly data are presented. Caution must be exercised when using these summaries as the data reflect conditions occurring only during limited duty hours of operation. This report is a five-part statistical summary of surface weather observations for Bad Kreuznach, West Germany. It contains the following parts: (A)Weather conditions; (C) Surface winds; (D) Ceiling versus visibility, (E) Psychrometric summaries (psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (F) Pressure summary (means, standard deviations and observation counts of station and/or sea-level pressure). Summaries in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables. GRA

N84-26244# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: PLATTSBURGH AFB, NEW YORK Final Report
24 Jan. 1984 425 p Supersedes USAFETAC DS-79/106
(AD-A140244; AD-E850613; USAFETAC/DS-84/005; USAFETAC/DS-79/106) Avail: NTIS HC A18/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Plattsburgh Air Force Base, New York. It contains the following parts: (A)Weather conditions; Atmospheric phenomena; (B)Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C)Surface winds; (D)Ceiling versus visibility; sky cover; (E)Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F)Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-26245# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: MCGHEE-TYSON AIRPORT, TENNESSEE Final Report
30 Jan. 1984 437 p
(AD-A140245; AD-E850614; USAFETAC/DS-84/006) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for McGHee-Tyson Airport, Tennessee. It contains the following parts: (A)Weather conditions; Atmospheric phenomena; (B)Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C)Surface winds; (D)Ceiling versus visibility; sky cover; (E)Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F)Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-26246# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F:: UPPER HEYFORD RAF, UK Final Report
6 Mar. 1984 400 p Supersedes USAFETAC/DS-79/097
(AD-A140246; AD-E850622; USAFETAC/DS-84/010; USAFETAC/DS-79/097) Avail: NTIS HC A17/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Upper Heyford RAF, United Kingdom. It contains the following parts: (A)Weather conditions; Atmospheric phenomena; (B)Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C)Surface winds; (D)Ceiling versus visibility; sky cover; (E)Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F)Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure).

Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-26247# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: WOODBRIDGE RAF, UNITED KINGDOM Final Report
7 Mar. 1984 325 p Supersedes USAFETAC/DS-78/011 (AD-A140247; AD-E850623; USAFETAC/DS-84/011; USAFETAC/DS-78/011) Avail: NTIS HC A14/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Woodbridge RAF, United Kingdom. It contains the following parts: (A)Weather conditions; Atmospheric phenomena; (B)Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C)Surface winds; (D)Ceiling versus visibility; sky cover; (E)Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F)Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-26248# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: LAKENHEATH, UNITED KINGDOM Final Report
1 Mar. 1984 375 p Supersedes USAFETAC/DS-79/110 (AD-A140248; AD-E850624; USAFETAC/DS-84/008; USAFETAC/DS-79/110) Avail: NTIS HC A16/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Lakenheath RAF, United Kingdom. It contains the following parts: (A)Weather conditions; Atmospheric phenomena; (B)Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C)Surface winds; (D)Ceiling versus visibility; sky cover; (E)Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F)Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-26249# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: KADENA AB, JAPAN Final Report
1 Mar. 1984 390 p Supersedes USAFETAC/DS-81/001 (AD-A140249; AD-E850625; USAFETAC/DS-84/009; USAFETAC/DS-81/001) Avail: NTIS HC A17/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Kadena AB, Japan. It contains the following parts: (A)Weather conditions; Atmospheric phenomena; (B)Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C)Surface winds; (D)Ceiling versus visibility; sky cover; (E)Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F)Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-26250# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: BENTWATERS RAF UNITED KINGDOM Final Report
9 Mar. 1984 409 p Supersedes USAFETAC/DS-79/098 (AD-A140250; AD-E850626; USAFETAC/DS-84/012; USAFETAC/DS-79/098) Avail: NTIS HC A18/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Bentwaters RAF, United Kingdom. It contains the following parts: (A)Weather conditions; Atmospheric phenomena; (B)Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (C)Surface winds; (D)Ceiling versus visibility; sky cover; (E)Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F)Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-26251# Photometrics, Inc., Woburn, Mass.
DETERMINATION OF STRATOSPHERIC WIND PROFILES BY DIGITAL ANALYSIS Final Report, 14 Aug. 1981 - 13 Aug. 1983
C. A. Trowbridge 4 Jan. 1984 45 p
(Contract F19628-81-C-0146; AF Proj. 6687)
(AD-A140502; PHM-TR-84-02; AFGL-TR-84-0041) Avail: NTIS HC A03/MF A01 CSCL 04/2

A program to measure altitude profiles of the horizontal wind velocity in the stratosphere using smoke trail tracers is described. The system for accessing and digitizing photographs of the sunlight scattering trails was updated with new hardware and software. Film plane coordinates of trail center lines were identified by computer programs, and vector triangulation was applied to determine three-dimensional coordinates of the trail. Highly accurate camera orientations were obtained for input to the triangulation procedure by digitizing images of known stars. Time sequences of positions of points on the trail centerline were then processed to determine the horizontal wind field and its vertical shears. GRA

N84-26252# National Hurricane Center, Coral Gables, Fla.
TROPICAL CYCLONE DATA TAPE FOR THE NORTH ATLANTIC BASIN, 1886 - 1983: CONTENTS, LIMITATIONS AND USES
B. R. Jarvinen, C. J. Neumann, and M. A. S. Davis Mar. 1984 28 p refs
(NOAA-TM-MWS-NHC-22; NOAA-84031202) Avail: NTIS HC A03/MF A01 CSCL 04B

The National Hurricane Center maintains a computer file on North Atlantic tropical cyclones. The file contains dates, tracks, wind speeds, and central pressure values (if available) for all tropical cyclones occurring over the 98-year period, 1886 through 1983 and is updated annually. The data organization, format, and limitations are discussed and several uses of the data are demonstrated. Author (GRA)

N84-26253# National Oceanic and Atmospheric Administration, Washington, D. C. Federal Coordinator for Meteorological Services and Supporting Research.
FEDERAL PLANS FOR COOPERATIVE BACKUP AMONG OPERATIONAL PROCESSING CENTERS
23 Jan. 1984 64 p refs

(PB84-174796; FCM-P14-1984) Avail: NTIS HC A04/MF A01 CSCL 04B

Cooperative support and backup among civil and military meteorological services and emergency backup procedures for the National Meteorological Center (NMC) at Suitland, Maryland, and the National Severe Storms Forecast Center (NSSFC) at Kansas City, Missouri, are described. The meteorological services have become increasingly dependent on centralized computer facilities and automated telecommunication facilities. The Department of Defense (DoD) weather and/or oceanographic processing centers are the Air Force Global Weather Central (AFGWC) and the Fleet Numerical Oceanography Center (FNOC). These several processing centers collect and relay meteorological data and are the major source for both analysis and forecast products. Any prolonged disruption in a processing center service will profoundly affect all users. The intent is to complete computer to computer linkages to the extent that the service missions permit. GRA

N84-26254# Princeton Univ., N. J.
ON THE STRUCTURE OF THE NARROW COLD-FRONTAL RAINBAND Ph.D. Thesis
George William Kent Moore 1983 153 p
Avail: Univ. Microfilms Order No. DA8405125

Narrow cold frontal rainbands are lines of intense precipitation that straddle surface cold fronts. The rainfall in the narrow cold frontal rainband is organized into regularly spaced ellipsoidal cells called precipitation cores. Interaction between convective activity in the frontal zone and the horizontal wind shear associated with the low level jet is responsible for the cellular structure of the narrow cold frontal rainband. A linear stability analysis is performed on an idealized frontal zone consisting of a line of convection coincident with a line of cyclonic shear. Two different models of the convective processes are used. Analysis of the models suggests that the regularly spaced precipitation cores in the rainband are the result of interaction between the convective activity in the frontal zone and the horizontal wind shear associated with the low level jet. Dissert. Abstr.

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-26255# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SEASONAL OSCILLATIONS OF THE SUBTROPICAL CONVERGENCE BETWEEN THE BRAZIL AND MALVINAS CURRENTS, USING OCEANOGRAPHIC AND SMS-2 SATELLITE DATA
Sueli Susana deGodoi (Sao Paulo Univ., Brazil) and Merritt Raymond Stevenson (Inst. for Space Research, Sao Jose dos Campos, Brazil) May 1984 12 p refs Presented at the 15th ISPRS Intern. Soc. for Photogrammetry and Remote Sensing, Rio de Janeiro, 18-20 Jun. 1984
(INPE-3092-PRE/497) Avail: NTIS HC A02/MF A01

Seasonal variations of the Subtropical Convergence (S.C.) between the Brazil Current and Malvinas (Falkland) Current were investigated. Oceanographic and SMS-2 data were utilized for this purpose. Maps of the surface distributions of temperature and salinity were made using oceanographic data. Thermal infrared images were received from the VISSR system aboard the SMS-2 satellite. The satellite data were compared with a Gaussian Model in order to better evaluate thermal distributions. Where oceanographic data were available for comparison with SMS-2 data, the S.C. was located at or near the same position. The SMS-2 satellite data indicated, in the period of January 1980 to March 1981, the occurrence of zonal and latitudinal oscillations of the S.C. In this period, the movement of the S.C. tended to be dominated by its latitudinal fluctuations in relation to its displacement in the zonal direction. Between autumn (April to June) and spring (October to December), the mean migratory velocity in the latitudinal direction was about 1.5 cm/s; while in the zonal direction, the velocity was about 0.7 cm/s. The thermal data obtained from the VISSR system corresponded well with oceanographic data and demonstrated that temperature data from the SMS-2 satellite may be effectively used to detect and monitor the Subtropical Convergence. Author

N84-26256# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MAPS OF FAVORABLE AREAS FOR TUNA FISHING TO THE SOUTH AND SOUTHEAST OF BRAZIL PREPARED FROM SMS-2 SATELLITE DATA
Myrian de Moura Abdon May 1984 12 p refs Presented at the 15th ISPRS Intern. Soc. for Photogrammetry and Remote Sensing, Rio de Janeiro, 17-29 Jun. 1984
(INPE-3102-PRE/501) Avail: NTIS HC A02/MF A01

Sea surface temperature intervals suitable for large fish catch of yellowfin tuna, albacore and bigeye tuna were defined in oceanic water to the South and Southeast of Brazil. Maps of favorable dishing areas for these species were prepared for the period of February to July of 1980. In the development of these maps, infrared images received from the SMS-2 satellite were automatically processed by computer on the Image-100 system. The favorable fishing areas and tuna CPUE data of 1980 are compared and it is observed that albacore and bigeye tuna appeared in the southern part of the study area, mainly in Malvinas Current region. Albacore and bigeye tuna CPUE data of the years 1978 and 1979, with sea surface temperature, collected in real time, for a small area influenced by Subtropical Convergence were compared. It is shown that the suitable sea surface temperature intervals for the fishing of these tuna species changes from month to month during the year. E.A.K.

N84-26257# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
PAME PROCEEDINGS, PATTERN ANALYSIS IN THE MARINE ENVIRONMENT, AN OCEAN SCIENCE AND TECHNOLOGY WORKSHOP Final Report
R. M. Brown Oct. 1983 289 p Workshop held at Bay St. Louis, Miss., 24-26 Mar. 1982
(AD-A140195; NORDA-TN-176) Avail: NTIS HC A13/MF A01 CSCL 08/3

The Pattern Analysis in the Marine Environment (PAME) Workshop Proceedings contains 10 of the papers presented at an Ocean Science and Technology Workshop sponsored by the Chief of Naval Research and hosted by the Naval Ocean Research and Development Activity, NSTL, Mississippi, 24 to 26 March 1982. The PAME Workshop topics ranged from computer science, pattern analysis, and artificial intelligence to specific problem areas, applications, and requirements in ocean science. The workshop was organized in the following five sessions: (1) image analysis techniques; (2) image analysis techniques; (3) pattern analysis techniques; (4) space technology for ocean applications; (5) ocean patterns in space time. For individual titles, see N84-26258 through N84-26267.

N84-26258# Massachusetts Univ., Amherst. Dept of Mathematics and Statistics.
CLUSTER ANALYSIS PACKAGE FOR IMAGE SEGMENTATION
M. F. Janowitz *In* Naval Ocean Res. and Develop. Activity PAME, Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 1-45 (For primary document see N84-26257 16-48)
(Contract N00014-79-C-0629)
(AD-P003117) Avail: NTIS HC A13/MF A01 CSCL 12/1

A description is given of the underlying motivation and actual implementation of a number of cluster analysis algorithms that can be used for the segmentation of images collected by remote sensing devices. The outputs of the various algorithms are illustrated on both real and simulated data. Author (GRA)

N84-26259# South Carolina Univ., Columbia. Dept. ot Geology.
FOURIER SHAPE ANALYSIS: A MULTIVARIATE PATTERN RECOGNITION APPROACH **c46**
R. Ehrlich and W. E. Full *In* Naval Ocean Res. and Develop.

Activity PAME Proc., Pattern Anal. in the Maringe Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 47-67 Prepared in cooperation with Wichita State Univ., Kan. (For primary document see N84-26257 16-48)
(AD-P003118) Avail: NTIS HC A13/MF A01 CSCL 12/1

This article describes the design of a simple image analysis procedure generating edge points of particles and a set of pattern recognition algorithms accomplishing end member (source) characterization and mixing proportions. GRA

N84-26260# Utah State Univ., Logan. Dept. of Mathematics.
FUZZY ALGORITHMS FOR PATTERN RECOGNITION c64
J. C. Bezdek *In* Naval. Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 69-119 (For primary document see N84-26257 16-48)
(Grant NSF MCS-80-02856)
(AD-P003119) Avail: NTIS HC A13/MF A01 CSCL 12/1

This paper contains: (1) a tutorial of the basic axiomatic structure underlying many fuzzy algorithms for pattern recognition; and (2) a summary of the theory and applications connected with several currently available fuzzy techniques. In particular, algorithms for clustering, feature selection, classification, and shape description are considered. Author (GRA)

N84-26261# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE USE OF SATELLITE OBSERVATIONS OF THE OCEAN SURFACE IN COMMERCIAL FISHING OPERATIONS c43
D. R. Montgomery *In* Naval Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 121-155 (For primary document see N84-26257 16-48)
(AD-P003120) Avail: NTIS HC A13/MF A01 CSCL 22/2

Commercial fishermen are interested in the safety of their crews, boats, and gear, and in making the best catch for their time and money. Rising fuel costs, increased competition from foreign fisheries, improved knowledge about fish habits and the new 200 mile economic zone have all had an impact on the U.S. fishing industry. As a consequence, the modern fisherman, more than ever, requires reliable and timely information about the marine environment. This paper describes an experimental program to utilize satellite observations of the ocean surface, in conjunction with conventional observations and products, to prepare special fisheries aids charts for daily radio facsimile broadcasts to commercial fishermen. These special fisheries products aggregate a broad set of ocean observations, including ocean color structure, to depict oceanographic conditions of importance to commercial fishing tactics. Results to date have shown that improved safety at sea and decreased fuel costs can be achieved through the applied use of these special fisheries charts. Author (GRA)

N84-26262*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DIGITALLY CONTROLLED SONARS c32
G. R. Hansen *In* Naval Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 157-171 (For primary document see N84-26257 16-48)
(Contract NAS7-100)
(AD-P003121) Avail: NTIS HC A13/MF A01 CSCL 17/1

Sonars are usually designed and constructed as stand alone instruments. That is, all elements or subsystems of the sonar are provided: power conditioning, displays, intercommunications, control, receiver, transmitter, and transducer. The sonars which are a part of the Advanced Ocean Test Development Platform (AOTDP) represent a departure from this manner of implementation and are configured more like an instrumentation system. Only the transducer, transmitter, and receiver which are unique to a particular sonar function; Up, Down, Side Scan, exist as separable subsystems. The remaining functions are reserved to the AOTDP and serve all sonars and other instrumentation in a shared manner. The organization and functions of the common AOTDP elements were described and then the interface with the sonars discussed. The techniques for software control of the sonar parameters were explained followed by the details of the realization of the sonar functions and some discussion of the performance of the side scan sonars. GRA

N84-26263# McQuest Marine Research and Development Co. Ltd., Burlington (Ontario).
APPLICATION OF COMPUTER IMAGE PROCESSING TO UNDERWATER SURVEYS c43
P. R. Paluzzi *In* Naval Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 173-188 (For primary document see N84-26257 16-48)
(AD-P003122) Avail: NTIS HC A13/MF A01 CSCL 20/6

Computer image processing has often come to be equated with automated pattern analysis, particularly within the context of spacecraft remote-sensing. Automated pattern analysis in the form of multispectral classifications has been widely used for crop and lithologic mapping from LANDSAT images. Conversely, bottom photographs and side-scan sonar images collected during underwater surveys have rarely been subjected to automated pattern analysis. Among the reasons for this are limitations of the imaging techniques and complexity in terms of scene and pattern descriptions. It is therefore worthwhile to consider alternatives to pattern analysis for helping interpreters to work with images from underwater surveys. Computer dc notch filtering and geometric rectification by resampling are two key image processing techniques which have proved to be successful in achieving this goal. In addition, since image interpreters often compare bottom photographs and side-scan sonar records to other map based data, namely depth soundings or bathymetry, it is advantageous to also display these data as an image. Finally, while the alternative computer image processing techniques are, by themselves, powerful tools for improving image display, they also show promise for alleviating some of the problems facing automated pattern analysis as applied to underwater survey images. Author (GRA)

N84-26264# California Univ., San Diego. Inst. of Geophysics and Planetary Physics.
THE IDENTIFICATION AND INVERSION OF ACOUSTIC MULTIPATH DATA AT LONG RANGE IN THE OCEAN c71
M. G. Brown *In* Naval. Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 189-197 (For primary document see N84-26257 16-48)
(AD-P003123) Avail: NTIS HC A13/MF A01 CSCL 20/1

Due to the presence of the ocean sound channel, in general many ray paths (multipaths) connect a given acoustic source receiver pair in the ocean. The number and structure of the multipaths depend on the details of the sound channel and the positions of the source and receiver. As each multipath samples the ocean differently each contains unique information about the sound speed structure of the ocean. In order to exploit this information one must first identify each of the measured multipath arrivals. Here the author addresses the related problems of identifying multipath arrivals and the subsequent inversion of this data for the ocean structure. Author (GRA)

N84-26265# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
PRINCIPAL COMPONENTS AS A METHOD FOR ATMOSPHERICALLY CORRECTING COASTAL ZONE COLOR SCANNER DATA c65
R. J. Holyer *In its* PAME Proc., Pattern Anal. in the Marine Environ., An Ocean and Technol. Workshop Oct. 1983 p 199-223 (For primary document see N84-26257 16-48)
(AD-P003124) Avail: NTIS HC A13/MF A01 CSCL 12/1

The Coastal Zone Color Scanner (CZCS) images the Earth's oceans in five visible/near-IR spectral bands. In the visible portion of the electromagnetic spectrum, satellite observed radiance typically consists of approximately 90% of atmospheric backscatter and 10% of ocean-scattered radiance. Subtle color signatures

associated with oceanic features are frequently masked by this atmospheric path radiance. Accurate atmospheric correction of CZCS data is, therefore, a prerequisite to optimum information extraction from this imagery. The most widely accepted atmospheric correction scheme for CZCS data, based on a single scattering model of the atmosphere plus certain assumed optical properties of the ocean, has several inherent drawbacks that limit its effectiveness. Principal Components Analysis, a common pattern recognition tool, is offered as an alternate atmospheric correction scheme based upon a statistical rather than a modeling approach. The principal components method is applied to a representative CZCS data set and a comparison is made wth corrections derived by the modeling method. Author (GRA)

N84-26266# Naval Oceanographic Office, Bay St. Louis, Miss.
WATER MASS CLASSIFICATION IN THE NORTH ATLANTIC USING IR DIGITAL DATA AND BAYESIAN DECISION THEORY **c65**
R. E. Coulter *In* Naval Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 225-236 (For primary document see N84-26257 16-48)
(AD-P003125) Avail: NTIS HC A13/MF A01 CSCL 12/1

A method is described which utilizes Bayesian decision theory and historical statistics of sea surface temperature to classify surface water masses and ocean fronts from satellite derived infrared data. Probabilities that certain features occur are determined from the normal distributions of specific statistical characteristics, known a priori, and the same characteristics computed from satellite data. The better the match between the a priori information associated with a feature and the computed statistics, the higher the probability that the feature exists. The maximum probability determined by Baye's theory is subjected to two tests, based on absolute and relative threshold values, to reduce the chance of incorrect classification. The method was used for classifying satellite IR data to locate the major water masses in the Gulf Stream region. Results were compared to frontal positions obtained by conventional, subjective means. Author (GRA)

N84-26267# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
SPATIAL IMAGE PROCESSING MASKS FROM FREQUENCY DOMAIN SPECIFICATIONS **c64**
E. R. Meyer and R. C. Gonzalez *In* Naval. Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 237-247 (For primary document see N84-26257 16-48)
(AD-P003126) Avail: NTIS HC A13/MF A01 CSCL 12/1

A method for obtaining a spatial convolution mask from a frequency domain specification is discussed. This technique is motivated by the need in many applications to achieve processing speeds that cannot be met via Fourier transform formulations. The method is illustrated with synthetic and forward looking infrared (FLIR) images. Author (GRA)

N84-26268# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
ELECTROMAGNETIC PROPERTIES OF SEA ICE
R. M. Morey, A. Kovacs, and G. F. N. Cox Jan. 1984 42 p
(Contract DE-AI21-83MC20022)
(AD-A140330; CRREL-84-2) Avail: NTIS HC A03/MF A01 CSCL 08/12

Investigations of the in situ complex dielectric constant of sea ice were made using time-domain spectroscopy. It was found that: (1) for sea ice with a preferred horizontal crystal c-axis alignment, the anisotropy of polarizing properties of the ice increased with depth, (2) brine inclusion conductivity increased with decreasing temperature down to about -8 C, at which point the conductivity decreased with decreasing temperature, (3) the DC conductivity of sea ice increased with increasing brine volume. (4) the real part of the complex dielectric constant is strongly dependent upon brine volume but less dependent upon the brine inclusion orientation, (5) the imaginary part of the complex dielectric constant was strongly dependent upon brine inclusion orientation but much less dependent upon brine volume. Because the electromagnetic (EM) properties of sea ice are dependent upon the physical state of the ice, which is continually changing, it appears that only trends in the relationships between the EM properties of natural sea ice and its brine volume and brine inclusion microstructure can be established. GRA

N84-26269# Geological Survey, Woods Hole, Mass.
GEORGES BANK MONITORING PROGRAM: ANALYSIS OF TRACE METALS IN BOTTOM SEDIMENTS DURING THE SECOND YEAR OF MONITORING Final Report
M. H. Bothner, R. R. Rendigs, E. Campbell, M. W. Doughten, and C. M. Parmenter 1 Dec. 1983 96 p refs
(Contract DI-14-12-0001-30025)
(PB84-169465; MMS/ATES-84/04) Avail: NTIS HC A05/MF A01 CSCL 08J

Ocean bottom sediments on Georges Bank were examined to establish the concentrations of trace metals therein and to quantify the changes in trace metal concentrations that are related to petroleum exploration drilling activities. The concentration of barium increased as a result of drilling to about 5.9 times the background level in bulk sediment near the drill site in Block 410. The maximum barium concentration at this location was 172 parts per million (ppm). This value is within the range of predrilling concentrations (28 to 300 ppm) measured at the regional stations. No drilling-related changes in the concentrations of chromium or other metals have been observed in bulk sediments at any of the locations. R.S.F.

N84-26270# National Oceanic and Atmospheric Administration, Miami, Fla. Oceanographic and Meteorological Labs.
ACOUSTIC RAY-PATH FLUCTUATIONS INDUCED BY EL NINO
L. M. Lawson and D. R. Palmer Jan. 1984 15 p refs
(PB84-167709; NOAA-TM-ERL-AOML-56; NOAA-84030701) Avail: NTIS HC A02/MF A01 CSCL 08J

The degree to which an El Nino event can be monitored using acoustic tomographic techniques was assessed. In tropical waters an acoustic ray entering the near-surface region from below usually is strongly refracted because of the steep gradient in the sound speed, and therefore turns over very rapidly. Since the temperature perturbation associated with an El Nino event is restricted to this near-surface region, there has been some concern that ray path travel-time fluctuations would be too small to be easily detected. From data measured during the 1982-1983 El Nino event, the travel-time fluctuations are large enough to be easily measured for almost all ray-path configurations of interest. Author (GRA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-26271# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE INITIAL ORIENTATION OF HOMING PIGEONS ON THE MAGNETIC EQUATOR, WITH AND WITHOUT SUN COMPASS
R. Ranvaud, K. Schmidt-Koenig (Tubingen Univ., West Germany), J. Kiepenheuer (Tubingen Univ., West Germany), and O. C. Gasparotto (Sao Paulo Univ., Brazil) May 1984 9 p refs Submitted for publication
(INPE-3104-PRE/503) Avail: NTIS HC A02/MF A01

The homing behavior of pigeons at the magnetic equator, where the field lines are horizontal, should provide either no magnetic compass or, an axial compass with a 180 deg ambiguity was observed. Pigeons released near noon were deprived of their Sun compass. It is found that the initial orientation of all groups of birds tests was significantly nonrandom, which indicates some form of navigation is still possible under all the experimental conditions. The bearings chosen by the noon birds, however, are different from those chosen by birds released in the morning or in the

afternoon, which emphasizes central importance of the Sun compass. E.A.K.

N84-26272# Office of Technology Assessment, Washington, D.C.
COMMERCIAL BIOTECHNOLOGY: AN INTERNATIONAL ANALYSIS
Jan. 1984 607 p refs
(PB84-173608; OTA-BA-218; LC-84-601000) Avail: NTIS HC A99/MF A01 CSCL 06B

The competitive position of the United States relative to Japan and four European countries - the Federal Republic of Germany, the United Kingdom, Switzerland, and France - in the commercial development of new biotechnology is assessed. Japan and other countries identified new biotechnology as a promising area for economic growth and have therefore invested quite heavily in R&D in this field. Congressional policy options for improving U.S. competitiveness in new biotechnology are identified. The industrial use of recombinant DNA (rDNA), cell fusion, and noval bioprocessing techniques, are emphasized. GRA

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-26273 Ohio State Univ., Columbus.
THE DEVELOPMENT OF A BIDIRECTIONAL MULTI-SPEED IMPACT MODEL OF THE ADULT HUMAN THORAX Ph.D. Thesis
John Frederick Weichel 1983 457 p
Avail: Univ. Microfilms Order No. DA8403586

An analytical computer model of a two dimensional cross section of the thorax is developed which accurately simulates measured impact response. The model uses the general system modeling program MADYNO and focuses on simulating the motion of the bony structure of the thorax when impacted from the front or side. Forces and kinematics along the axis of the spine are not considered. Values of the parameters in the model are obtained from published biomechanical data or chosen on the basis of the results of the simulation when compared with the measured response of a selected front or side impact. Boundary conditions are handled by defining the acceleration of the spine as an input to the simulation. The model is validated by simulating the response of eight other cadaver thoracic impact tests performed by the Highway Safety Research Institute. The data base includes five frontal and five side pendulum impacts to the chest with impactor speeds of 4.27 m/s (14 ft/s) and 0.91 m/s (3 ft/s). Dissert. Abstr.

N84-26274*# Johns Hopkins Univ., Baltimore, Md. Dept. of Materials Science and Engineering.
ULTRASONIC AND OPTICAL EVALUATION OF SURGICAL IMPLANT MATERIALS AND DEVICES. A DURABILITY STUDY OF PERICARDIAL BIOPROSTHESES Technical Progress Report
P. R. Schuster May 1984 103 p refs
(Grant NAG1-211)
(NASA-CR-173437; NAS 1.26:173437) Avail: NTIS HC A06/MF A01 CSCL 06B

Laser Doppler Anemometry (LDA) and accelerated fatigue testing were used in an attempt to assess the durability of two cardiac value bioprostheses. The LDA system was used to monitor the function of the cardiac valves over time. This was done through flow characterization in an aortic flow chamber, designed to closely simulate in vivo conditions, both in the near vicinity (sinuses of valsalva region) and also somewhat downstream (aortic region) from the values. The accelerated fatigue tester was operated by opening and closing the valves at a rate of 1300 R.P.M., about 18 x the normal rate. The results from the two test valves indicate a definite change in the flow characteristics downstream from the valve after certain accelerated test intervals. The high velocity cross-sectional flow area seems to increase over time in use, causing a decrease in the peak velocity. The tissue became more flaccid in certain areas, and tears were apparent at about 9.4 million cycles for the Ionescu-Shiley valve and at 24 million cycles for the Carpentier-Edwards valve. The use of Doppler ultrasound as a technique for monitoring the function of bioprostheses over time in vivo is also discussed. M.G.

N84-26275*# Baylor Coll. of Medicine, Houston, Tex. Dept. of Medicine.
A STUDY OF STRESS-FREE LIVING BONE AND ITS APPLICATION TO SPACE FLIGHT Final Report
Adrian LeBlanc and Melvin Spira Dec. 1983 47 p refs
(Contract NAS9-16442)
(NASA-CR-171786; NAS 1.26:171786) Avail: NTIS HC A03/MF A01 CSCL 06P

Observations of animals and human subjects in weightless space flight (Skylab and COSMOS) document altered bone metabolism. Bone metabolism is affected by a number of local and systemic factors. The calcification and growth of transplanted bone is independent of local muscle, nervous, and mechanical forces; therefore, transplanted bone would provide data on the role of local vs. systematic factors. Bone metabolism in living transplanted bone, devoid of stress, was investigated as a possible tool for the investigation of countermeasures against disuse bone loss. An animal model using Sprague-Dawley rats was developed for transplantation of femur bone tissue on a nutrient vascular pedicel. The long term course of these implants was assessed through the measure of regional and total bone mineral, blood flow, and methylene diphosphonate (MDP) uptake. Clomid, an estrogen agonist/antagonist, was shown to protect bone from disuse loss of minerals by retarding trabecular and cortical resorption. R.S.F.

N84-26276*# National Aeronautics and Space Administration, Washington, D. C.
DEVELOPMENT OF A NEW, COMPLETELY IMPLANTABLE INTRAVENTRICULAR PRESSURE METER AND PRELIMINARY REPORT OF ITS CLINICAL EXPERIENCE
K. Osaka, T. Murata (Kyoto Univ.), S. Okamoto (Kyoto Univ.), T. Ohta, T. Ozaki, T. Maeda, K. Mori (Kyoto Univ.), H. Handa (Kyoto Univ.), S. Matsumoto (Kobe Univ.), and I. Sakaguchi (Nagano Keiki Seisakusho Ltd., Japan) Jul. 1982 24 p refs Transl. into ENGLISH from Neurol. Med. Chir. (Tokyo), v. 21, 1981 p 1051-1060 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Osaka Medical Coll., Japan
(Contract NASw-3541)
(NASA-TM-77121; NAS 1.15:77121) Avail: NTIS HC A02/MF A01 CSCL 06B

A completely implantable intracranial pressure sensor designed for long-term measurement of intraventricular pressure in hydrocephalic patients is described. The measurement principal of the device is discussed along with the electronic and component structure and sources of instrument error. Clinical tests of this implanted pressure device involving both humans and animals showed it to be comparable to other methods of intracranial pressure measurement. R.S.F.

N84-26277# Army Research Inst. of Environmental Medicine, Natick, Mass.
ANTHROPOMETRIC CHANGES AT HIGH ALTITUDE
C. S. Fulco, A. Cymerman, N. A. Pimental, A. J. Young, and J. T. Maher 27 Mar. 1984 22 p
(DA Proj. 3E1-62777-A-879)
(AD-A140311; USARIEM-M19/84) Avail: NTIS HC A02/MF A01 CSCL 06/14

Eight men (18-25 yr) were evaluated before, during and after 18-days residence on the summit of Pikes Pake, CO (4300 m; HA) to describe the anthropometric changes associated with weight loss and to test the accuracy of a number of previously published prediction equations in assessing any alteration of the relative fat-to-lean tissue ratio during exposure to HA. Body weight (BW), ten circumference (C) and seven skinfold (SF) measurements were obtained preprandial at sea level (SL) and on days 2,4,6,9,12,

16 and 18 at HA. Body density was estimated by hydrostatic weighting (HW) pre- and post-HA. BW differed from SL($P<.01$) after day 9 at HA. HW indicated that the pre- to post-HA weight loss was partitioned into a 2.06 kg loss in fat-free body mass ($P<.001$) and an insignificant increase in fat wt (0.58 kg). Percent body fat (BF) increased from 16.6 to 17.7 ($P<.02$). After day 9 of HA, the sum of SF and C measurements increased ($P<.02$) and decreased ($P<.05$) from SL, respectively. The largest changes occurred in the chest and scapula SF and in the C of the hip, neck, calf and 2 abdominal sites. Based on the lack of concurrence with the results from the hydrostatic weightings, it was conducted that SF and C measurements and/or prediction equations do not provide an accurate assessment of the altered fat-to-lean ratio during weight loss at high altitude. GRA

N84-26278# Boston Univ., Mass. School of Medicine.
HEMATOLOGIC AND BIOCHEMICAL DATA ON HEALTHY INDIVIDUALS PARTICIPATING IN A PHYSICAL CONDITIONING PROGRAM
E. N. Serrallach, R. C. Dennis, C. Rushin, J. Hay, and M. Klein 28 Sep. 1983 39 p
(Contract N00014-79-C-0168)
(AD-A140464; BUSM-83-14) Avail: NTIS HC A03/MF A01 CSCL 06/14

Fifty-eight (58) relatively sedentary adults who were recruited into a physical fitness program involving 10 weeks of closely supervised, standardized and monitored exercises, were evaluated, physically, hematologically, and biochemically before and after participation in the program. Most of the participants were subjected to 16 different laboratory tests both before and after participation; a smaller group was subjected to as many as 20 tests. Physical responses to the conditioning program included a loss of body fat averaging 5%, a 3% of total body weight, a 32% excess body weight loss, decreased pulse rates at peak exertion of 5% and following the recovery period of 11%, an increased aerobic capacity (VO2 max) of 8%, and an increased rate of sit-up performance of 28%. Statistically significant changes in laboratory data included drops in total hemoglobin and MCHC, increased red cell P50 and LDH, decreased serum cholesterol and triglycerides, increased serum HDL-cholesterol, and decreased plasma phosphorus. GRA

N84-26279# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AERMEDICAL SUPPORT IN MILITARY HELICOPTER OPERATIONS
Apr. 1984 99 p refs Lecture series held in Soesterberg, Netherlands, 4-5 Jun., Fuerstenfeldbruck, West Germany, 7-8 Jun., and Oslo, 12-13 Jun. 1984
(AGARD-LS-134; ISBN-92-835-1468-8) Avail: NTIS HC A05/MF A01

The medical aspects of military helicoper operations are discussed. Emphasis is placed on pilot performance and the physiological and psychological stresses that effect flight operations. Visual and acoustic perception is discussed with methods of protection against hazardous environments included. Specifics such as flight crew back injuries, emergency medical evacuation, and crash injury analysis are also investigated. For individual titles, see N84-26280 through N84-26289.

N84-26280# Army Aeromedical Research Lab., Fort Rucker, Ala.
AEROMEDICAL SUPPORT IN MILITARY HELICOPTER OPERATIONS
D. R. Price *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 2p (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

A comprehensive update for the flight medical officer and other personnel providing aeromedical support for military helicopter operations is given. Areas that are addressed include: stressful missions such as nap-of-the-earth flying, night operations, and operations under other unfavorable circumstances; extended operations, aircrew fatigue, and its monitoring and prevention: visual protection and enhancement; perceptual illusions, their generation and disorienting effects in helicopter flight; acoustical hazards, auditory injury, hearing protection, and communications noise reduction; applied countermeasures for environmental extremes and the chemical warfare environment; helicopter accident and crash injury analysis; epidemiology, etiology, and prevention of back pain in helicopter pilots; and helicoper medical evacuation and rescue operations including evacuation of combat casualties. M.A.C.

N84-26281# British Army, Detmold (West Germany). Medical Centre.
STRESSFUL MISSION PROFILES, PART 1
S. J. Durnford *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 8p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

The stressors in those types of flights that are considered particularly stressful - NOE Nap Of the Earth flying, night flying with and without aids, mountain flying, flight over water, flight in Nuclear, Biological, and Chemical NBC clothing, instructional flying peacetime and flight in adverse weather conditions are described and analyzed. The stressors invoked by these flight profiles are set against the stressors found in all helicopter flying. M.A.C.

N84-26282# British Army, Detmold (West Germany). Medical Centre.
STRESSFUL MISSION PROFILES, PART 2: WORKLOAD AND FATIGUE **c54**
S. J. Durnford *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 8p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

The way that stressors combine with factors within the man (such as previous training) and the demands of the actual flying mission to produce an overall workload are investigated. The manner in which different levels of workload may affect performance are discussed and methods that might be used by flight surgeons to reduce aircrew workload levels are covered. The impact of future technology is briefly considered. M.A.C.

N84-26283# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
VISUAL PROBLEMS IN HELICOPTER OPERATIONS **c54**
D. H. Brennan *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 11p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

The importance of ocular physiology, visual standards, transparency optics and cockpit lighting systems in ensuring an adequate level of performance is discussed. Ocular hazards from impact, nuclear flash, chemical warfare agents and lasers are discussed and related to the advantages and disadvantages of protective equipment. A review of some of the devices currently available for visual enhancement and the problems associated with their use is included. M.A.C.

N84-26284# German Army, Bueckburg (West Germany). Aviation School.
DISORIENTATION IN HELICOPTER FLIGHT **c53**
Frank Fehler *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 15p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

The incapacity of the pilot to maintain a safe path of flight due to inadequate, erroneous or disregarded visual cues is investigated. The psychological process of visual perceptions is discussed espcially with regard to the differences between optical stimuli from the surroundings and their subjective perception by the individual. Emphasis is placed on the fact that the human brain is an active organ and not just a mirror reflecting the visual stimuli from outside. To minimize disorientation the aviator should have in mind the basic programs according to which the brain processes visual stimuli, visual configurations which are prone to

elicit visual illusions, and means to prevent the onset of disorientation. M.A.C.

N84-26285# German Air Force, Fuerstenfeldbruk (West Germany). Inst. of Aerospace Medicine.
HEARING LOSS ASSOCIATED WITH HELICOPTER FLIGHT
W. Neye *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 9p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

The occurrence and the influence of hearing damages caused by aircraft noise is investigated. In the audiometry tests conducted in the course of examinations for qualification, marked hearing losses in the high frequencies, especially in Army helicoper pilots are occasionally found. Through a comparative examination an attempt is made to determine whether higher hearing losses can be observed in helicopter pilots of the Army as compared to pilots of the other Services. Helicoper specific noise characteristics that cause significant hearing losses in pilots, which are more pronounced in Army pilots as compared to pilots of other aircraft types are examined. M.A.C.

N84-26286# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THERMAL CONTROL PROBLEMS IN MILITARY HELICOPTERS **c54**
J. R. Allan *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 10p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

The origins of thermal problems in military helicopters are discussed and compared with those of fixed wing aircraft. Some typical helicopter sortie temperature profiles are presented for hot and cold environments. The requirements for protection from chemical warfare agents are described in relation to helicopter operations and the additional thermal problems arising from chemical protective assemblies and drills are described. Potential adverse effects on aircrew performance and fatigue are considered. Thermal hazards in post crash survival situations are also considered particularly those related to ditching in cold water. Various approaches to the relief of thermal stress in helicopter aircrew are considered. The limitation of engine powered environmental control systems and the potential advantages of personal conditioning systems are described. The advantages of liquid conditioned systems are compared with air systems. Cold environment protection is described in terms of insulation and water exclusion and the role of electrically heated garments is described. M.A.C.

N84-26287# Army Safety Center, Fort Rucker, Ala.
MEDICAL ASPECTS OF HELICOPTER SAFETY AND CRASHWORTHINESS **c54**
Dennis F. Shanahan *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 13p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

A review of the past five years' accident experience reveals that 80 percent are attributed to human error. The relationship of errors to system eficiencies is established through human factors analysis. Once identified, appropriate measures can be instituted to correct these deficiencies. Principles of helicopter crashworthiness are reviewed, and the means for deriving these principles from crash injury analysis is discussed. M.A.C.

N84-26288# Army Safety Center, Fort Rucker, Ala.
BACK PAIN IN HELICOPTER FLIGHT OPERATIONS
Dennis F. Shanahan *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 9p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

One of the major medical problems associated with military helicopter flight operations is the high prevalence of back pain reported by flightcrews. Epidemiological surveys indicate that up to 75 percent of helicopter flightcrews complain of this affliction and that it is having a significant effect on manpower availability. The two most widely implicated etiological factors in this problem are poor posture dictated by control and seat configurations in most operational helicopters and the chronic vibration to which helicopter flightcrews are subjected. The epidemioloy and etiology of back pain in helicopter aircrews are examined and potential means for treatment and prevention discussed. M.A.C.

N84-26289# Danish Defence Command, Vedbaek. Aeromedical Services.
AEROMEDICAL SUPPORT OF HELICOPTER MEDICAL EVACUATION AND RESCUE OPERATIONS **c03**
Kund Jessen *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 5p (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

Factors effecting medical evacuation and rescue operations by helicopter are investigated. The importance of proper training of the flight and medical crews is emphasized. An evaluation of appropriate medical equipment is included along with a listing of most frequency encountered medical emergencies. Flight stress on the patient is also examined. M.A.C.

N84-26290# Drexel Univ., Philadelphia, Pa.
A MATHEMATICAL MODEL OF THE CARDIOVASCULAR SYSTEM UNDER +Gz STRESS Ph.D. Thesis
Chia-Lin Chu 1984 154 p
Avail: Univ. Microfilms Order No. DA8404708

A digital computer model of the human cardiovascular system has been developed. The model can be used for studying the cardiovascular system under conditions of +Gz stress. It can be used to investigate the effects of anti-G protection devices. The model includes simulation of the arterial and venous systems and the heart. It includes baroreceptor control of heart rate and venous tone, and allows the input of acceleration force and externally applied pressure to the system. The model has been used to study the impairment of cerebral function during Gz stress. Model predictions suggest that, for unprotected subjects, carotid pressure at eye level decreases to 50 mmHg (beginning of peripheral loss) at approximately 2.7 Gz. The pressure decreases to 20 mmHg (beginning of central light loss) at approximately 3.6 Gz. An anti-G suit provides an extra 1.1 to 1.5 Gz protection. Even though blood pressure supplying retinal vessels drops significantly at the above G levels, cerebral blood flow is maintained due to compensation mechanisms. Dissert. Abstr.

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N84-26291*# Old Dominion Univ., Norfolk, Va. Dept. of Psychology.
OCULOMETRIC INDICES OF SIMULATOR AND AIRCRAFT MOTION Final Report
James R. Comstock Washington NASA Jun. 1984 135 p refs (Grant NGT-47-003-800)
(NASA-CR-3801; NAS 1.26:3801) Avail: NTIS HC A07/MF A01 CSCL 05J

The effects on eye scan behavior of both simulator and aircraft motion and sensitivity of an oculometric measure to motion effects was demonstrated. It was found that fixation time is sensitive to motion effects. Differences between simulator motion and no motion conditions during a series of simulated ILS approaches were studied. The mean fixation time for the no motion condition was found to be significantly longer than for the motion conditions. Eye scan parameters based on data collected in flight, and in fixed base simulation were investigated. Motion effects were evident when the subject was viewing a display supplying attitude and

flight path information. The nature of the information provided by motion was examined. The mean fixation times for the no motion condition were significantly longer than for either motion condition, while the two motion conditions did not differ. It is shown that motion serves an alerting function, providing a cue or clue to the pilot that something happened. It is suggested that simulation without motion cues may represent an understatement of the true capacity of the pilot. E.A.K.

N84-26292# National Aerospace Lab., Tokyo (Japan).
PERCEPTION OF THE MOVEMENT OF VISUAL SCENES DURING HORIZONTAL BODY ROTATION
Naoki Isu, Jiro Koo, and Yoshihisa Ohkawa Nov. 1983 16 p refs In JAPANESE; ENGLISH summary
(NAL-TR-787; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

As the first step in clarifying the factor of motion sickness the way movement of visual scenes was perceived during body rotation was examined under two conditions: when visual scenes were moving coincidentally with the body and when they were kept stationary. These visual scenes are those represented in our daily life by, respectively, the view from inside and that from outside a moving vehicle (e.g. aircraft). For this purpose three experiments were conducted and their results led to the following conclusions: (1) the scenes moving coincidentally with the body (inside view) are not always perceived coincident with it, and the apparent movement of visual scenes is perceived when the body is rotated sinusoidally at frequencies higher than 0.2 Hz; (2) stationary scenes (outside view) with peripheral vision are perceived as stationary, but without peripheral vision they are perceived as moving. Further, by modeling the perception system of the movement of visual scenes, the frequency characteristics of the human vestibulo-ocular system were obtained. B.W.

N84-26293# Army Research Inst. of Environmental Medicine, Natick, Mass.
A SOFTWARE PACKAGE FOR ADMINISTERING AND MONITORING THE ENVIRONMENTAL SYMPTOMS QUESTIONNAIRE (ESQ-3)
C. S. Fulco, A. Cymerman, and P. B. Rock 28 Mar. 1984 19 p
(DA Proj. 3M1-61102-BS-10)
(AD-A140288; USARIEM-M20/84) Avail: NTIS HC A02/MF A01 CSCL 06/19

The latest version of the Environmental Symptoms Questionnaire (ESQ-3) contains 67 symptoms designed to allow researchers to evaluate a broad range of environmental stresses. We have developed an interactive computer software package that administers and monitors the ESQ-3. This package, written in a format maximizing clarity, provides consistency of administration from one test or day to another, checks for response inconsistencies, maintains subject motivation, provides feedback to the subject and allows an investigator to quickly inspect raw and computed results. Further, because there is no interaction between investigators and subjects, no experimental bias can be introduced. This package can be adapted to almost any computer system having a CRT and at least one disc drive. GRA

N84-26294# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DEVELOPMENT OF A MODEL FOR HUMAN OPERATOR LEARNING IN CONTINUOUS ESTIMATION AND CONTROL TASKS Final Report, 15 Jul. - 30 Sep. 1983
W. H. Levison Wright-Patterson AFB, Ohio Air Force Medical Research Labs. Dec. 1983 108 p
(Contract F33615-81-C-0517; AF Proj. 2312)
(AD-A140320; AFAMRL-TR-83-088) Avail: NTIS HC A06/MF A01 CSCL 05/5

This research was directed toward the development of an analytic tool for the design of training procedures and the assessment of trainee performance in the kinds of monitoring, decision, and control tasks required for flight management. Manual control data obtained in previous AFAMRL Laboratory studies was analyzed with regard to learning behavior. This analysis consisted of three steps: model analysis with the optimal control pilot model (OCM) to determine the relations between stages of training and independent pilot-related model parameters; tests of some hypotheses concerning the underlying effects of training on control-strategy development; and preliminary analysis to explore relationships between the perceptual cueing environment and the pilot's internalized representation (internal model) of the task situation. The results of the analysis suggest that continued practice on the tracking task leads to a more precise, consistent, and linear (i.e., less noisy) type of response behavior, and to an improved internal model. Analytic results further suggest that, if the OCM is modified to account for the pilot's ability to construct his internal model, the model should be able to predict the effects of the task structure (including plant dynamics, input spectra, and cueing environment) on the rate at which (and degree to which) the human operator develops his estimation and control strategies. GRA

N84-26295# Hawaii Univ., Honolulu. Dept. of Psychology.
EFFECTS OF APPRAISAL SALIENCE ON IMMEDIATE AND MEMORY-BASED JUDGMENTS Interim Technical Report
Janet L. Barnes-Farrell and Karen A. Couture Mar. 1984 32 p
(Contract N00014-83-K-0757)
(AD-A140334; TR-84-1) Avail: NTIS HC A03/MF A01 CSCL 05/10

This study investigated the effects of appraisal task salience and retention interval upon the accuracy of performance ratings. Subjects viewed videotaped samples of employee performance and provided performance ratings of the behavior of the target individual depicted in the videotapes. Analyses of variance an followup t-tests indicated no main effects for appraisal salience or retention interval on overall accuracy of rating or elevation scores. A significant two-way interaction between appraisal salience or retention interval was observed for overall accuracy and elevation. Further investigation showed that subjects primed for the appraisal task were more accurate then subjects in the low appraisal salience condition, when ratings were made a week after observation of performance. The implications of the findings for performance appraisal and for the design of appraisal research are discussed. GRA

N84-26296# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Psychology.
EYE MOVEMENTS AND VISUAL INFORMATION PROCESSING Annual Progress Report, 1 Jan. - 31 Dec. 1983
E. Kowler 23 Feb. 1984 12 p
(Grant AF-AFOSR-0085-82; AF Proj. 2313)
(AD-A140438; AFOSR-84-0279TR) Avail: NTIS HC A02/MF A01 CSCL 05/10

Eye movements determine the location and velocity of the retinal image. Thus, to understand how we see it is necessary to understand both how eye movements are controlled and how they effect visual information processing. The proposed research is concerned with both problems. Specifically: the effect of expectations on smooth eye movements; and the eye moves smoothly in the direction of expected future target motion. Experiments will determine how expectations and guesses about the direction of future motion are formulated and the relative contributions of expectations and retinal image motion to smooth eye movements. The effect of saccades and saccade-like stimulus perturbations on visual information processing: Saccades continually displace the retinal image, yet we see the world as a single coherent picture. Experiments will find out whether the visual system selectively tolerates rapid lateral displacements, or whether the decision to move the eye is required. Programming sequences of saccades: Experiments will show whether sequences of saccades can be pre-programmed, and whether use of such sequences improves performance of visual tasks. GRA

N84-26297# Arizona State Univ., Tempe. Dept. of Psychology.
PHYSIOLOGICAL ASSESSMENT OF AIRCRAFT PILOT WORKLOAD IN SIMULATED LANDING AND SIMULATED HOSTILE THREAT ENVIRONMENTS Final Report
E. Lindholm, C. Cheatham, J. Koriath, and T. M. Longridge Brooks AFB, Tex. AFHRL Apr. 1984 43 p

(Contract F33615-80-C-0020; AF Proj. 2313)
(AD-A140469; AFHRL-TR-83-49) Avail: NTIS HC A03/MF A01 CSCL 06/19

In two experiments, physiological metrics of cockpit workload were investigated in highly realistic flight simulators. In Experiment 1, non-pilot males were trained on a simulated landing task and a secondary, tone discrimination task while heart rate, skin conductance, and brain event-related potentials were continuously quantified. The results showed that heart rate was a more stable measure of workload than was skin conductance. Heart rate increased during each final approach to landing, and mean heart rate decreased as the subjects gained mastery over the task as a function of practice. Four ERP components (N1,P2,N2,P3) were statistically evaluated. As workload increased, N2 became more negative and P3 became less positive; also, as workload increased, the latency difference between P3 and N1 increased. Finally, a within-subject regression analysis was employed to express the extent to which the four ERP components were intercorrelated. This measure proved to have considerable power to predict how well individual subjects would perform on the landing tasks. In Experiment 2, rated male pilots flew a simulated mission involving threat by surface-to-air missiles (SAMs). Heart rate, respiration activity, and ERPs were quantified by means of a custom-designed, miniaturized recording system. The pilots were informed of the level of SAM threat by tones sounded in the headset. The results showed that heart rate and respiration activity increased as SAM threat increased. GRA

N84-26284# German Army, Bueckburg (West Germany). Aviation School.
DISORIENTATION IN HELICOPTER FLIGHT
Frank Fehler *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 15p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-26298*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
THE VERRUN AND VERNAL SOFTWARE SYSTEMS FOR STEADY-STATE VISUAL EVOKED RESPONSE EXPERIMENTATION Final Report
William H. Levison and Greg L. Zacharias Mar. 1984 222 p
(Contract NAS1-16982)
(NASA-CR-172311; L-5486; NAS 1.26:172311) Avail: NTIS HC A10/MF A01 CSCL 05H

Two digital computer programs were developed for use in experiments involving steady-state visual evoked response (VER): VERRUN, whose primary functions are to generate a sum-of-sines (SOS) stimulus and to digitize and store electro-cortical response; and VERNAL, which provides both time- and frequency-domain metrics of the evoked response. These programs were coded in FORTRAN for operation on the PDP-11/34, using the RSX-11 Operating System, and the PDP-11/23, using the RT-11 Operating System. Users' and programmers' guides to these programs are provided, and guidelines for model analysis of VER data are suggested. R.J.F.

N84-26299# European Space Agency, Paris (France).
INVESTIGATION OF INTERACTIONS BETWEEN HELMET-MOUNTED SIGHT/DISPLAY, SENSOR PLATFORM AND HUMAN PILOT
Erhard Danneberg, Ernst Kohnen, Helmut Stein, and Ulrich Stolzke Jun. 1983 220 p refs Transl. into ENGLISH of "Untersuchungen des Zusammerwirkens von Helmet-Mounted Sight/Display und Sensorschwenkrahmen unter Einschluss eines Piloten" rept. DVFLR-FB-81-30 DFVLR, Brunswick, Jun. 1981 181 p
(ESA-TT-746; DFVLR-FB-81-30) Avail: NTIS HC A10/MF A01; original German report available from DFVLR, Cologne DM 37,90

When helicopters are used at night and under conditions of poor visibility, technical aids must replace the pilot's lack of vision. The interaction of a Helmet Mounted Sight/Display (HMS/D), a moving sensor platform, and a human pilot as system user was investigated by means of laboratory, moving simulator, and flight tests. Particular emphasis was given to the technical potential of the HMS/D in the laboratory, the tracking accuracy which could be achieved by the pilot on the moving simulator, and the practical application under real, military flight conditions. R.S.F.

N84-26300# European Space Agency, Paris (France).
THE PROJECT COCKPIT INSTRUMENTS AND HUMAN ENGINEERING AS PART OF A JOINT RESEARCH PROGRAM ON AIRCRAFT GUIDANCE AND CONTROL AT THE TECHNICAL UNIVERSITY OF BRUNSWICK Final Report
Ralf Beyer Sep. 1983 83 p refs Transl. into ENGLISH of "Abschlussbericht des teilprojekts Bordinstrumentierung und Anthropotechnik in sonderforschungsbereich flugfuehrung der TU Braunschweig" rept. DFVLR-FB-82-13 DFVLR, Brunswick, Jan. 1982
(ESA-TT-783; DFVLR-FB-82-13) Avail: NTIS HC A05/MF A01; original German report available from DFVLR, Cologne DM 41,10

Human factors engineering relating to aircraft cockpit instrumentation is discussed. Display systems, control equipment, and the improvement of human factors engineering assessment methods and procedures were the focal points of the investigation. Pilot stress and vision measurement are described in detail. R.S.F.

N84-26301# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
FLIGHT DYNAMICS AND AIRCRAFT PILOTING
Jean-Claude Wanner 1983 210 p refs In FRENCH; ENGLISH summary Report will also be announced as translation ESA-TT-874
(ONERA-P-1983-1; ISSN-0078-379X; ESA-TT-874) Avail: NTIS HC A10/MF A01

After a presentation of the principle of piloted vehicle mechanics, the study of the aircrft longitudinal movement is undertaken. Assuming that the pilot counters with his lateral controls any sideslip, and that the aircraft plane of symmetry is vertical, the trajectory, is described in that same vertical plane. The natural modes (angle of attack oscillation, phugoid, aperiodic motion) of the small movements around the straight and level flight, the response to the pilot's commands, and the equilibrium stability, are studied. Small lateral movements around straight and level flight and of the aircraft response to lateral controls are studied. The small movements of the aircraft around the stabilized level flight in rotation are also examined. The assumptions of separation of longitudinal and lateral movements around the stabilized straight and level flight are validated. M.A.C.

N84-26302# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
HUMAN FACTORS ENGINEERING. PART 1: TEST PROCEDURES Final Report
J. C. Perkins, D. C. R. Benel, and L. W. Avery 30 Nov. 1983 640 p Supersedes TOP-02-2-803, TOP-04-3-515, TOP-06-2-502, TOP-02-3-516, TOP-05-2-545, TOP-06-3-525, TOP-1-2-611, TOP-03-3-521, TOP-05-3-507, TOP-07-3-510, and TOP-1-2-610
(AD-A140343; TOP-1-2-610-Pt-1; TOP-02-2-803; TOP-04-3-515; TOP-06-2-502; TOP-02-3-516; TOP-05-2-545; TOP-06-3-525; TOP-1-2-611; TOP-03-3-521; TOP-05-3-507; TOP-07-3-510; TOP-1-2-610) Avail: NTIS HC A99/MF A01 CSCL 05/5

The material in this TOP (Test Operations Procedure) is intended to be used for the Human Factors Engineering (HFE) assessment of all types of material and systems tested by TECOM (Test and Evaluation Command). Supplementary sources of guidance are indicated when required. It encompasses the HFE procedures for the testing of design, functional performance and environmental considerations for the major test functions (operability, maintainability, transportability, portability/usability, and

habitability) applicable to the HFE assessment. This TOP contains two parts: Part 1, Test Procedures and Part 2, HEDGE. Part 1, the Test Procedures, provides guidance on how to plan and conduct an HFE test. This part also includes specific test procedures and sample data collection forms, such as checklists, questionnaire/ interview sheets and other data collection forms. Part 2, the Human Factors Engineering Data Guide for Evaluation (HEDGE) provides planning guidance concerning what to test and includes guidance in the selection of applicable test functions, test conditions, performance tasks, and detailed design criteria. GRA

N84-26303# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
HUMAN FACTORS ENGINEERING. PART 2: HEDGE (HUMAN FACTORS ENGINEERING DATA GUIDE FOR EVALUATION)
30 Nov. 1983 397 p
(AD-A140391; TOP-1-2-610-Pt-2) Avail: NTIS HC A17/MF A01 CSCL 05/5

The purpose of the information in HEDGE is to expand test capabilities in considering the human element. It will provide a strategy for viewing an item which is undergoing testing from the standpoint of the soldier who must ultimately operate, maintain, or otherwise utilize it. The use of these materials, in addition to standard Task and Design Checklists and Questionnaires, will tailor HFE subtest to a specific item. These materials are intended to support test engineers not design engineers. They were designed with specific tasks in mind, i.e., preparing a Test Plan, conducting a test, analyzing and interpreting test data, and generating the test report. They were prepared under the cognizance of the TECOM Human Factors Engineering Directorate. GRA

N84-26282# British Army, Detmold (West Germany). Medical Centre.
STRESSFUL MISSION PROFILES, PART 2: WORKLOAD AND FATIGUE
S. J. Durnford *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 8p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

N84-26283# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
VISUAL PROBLEMS IN HELICOPTER OPERATIONS
D. H. Brennan *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 11p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

N84-26286# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
THERMAL CONTROL PROBLEMS IN MILITARY HELICOPTERS
J. R. Allan *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 10p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

N84-26287# Army Safety Center, Fort Rucker, Ala.
MEDICAL ASPECTS OF HELICOPTER SAFETY AND CRASHWORTHINESS
Dennis F. Shanahan *In* AGARD Aeromed. Support in Mil. Helicopter Operations Apr. 1984 13p refs (For primary document see N84-26279 16-52)
Avail: NTIS HC A05/MF A01

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N84-26304# Hochschule der Bundeswehr, Munich. (West Germany). Forschungsschwerpunkt Simulation und Optimierung Deterministischer und Stochastischer Dynamischer Systeme.
SEMINAR ON ZEROING METHODS AND APPLICATIONS, SPRING TRIMESTER, 1983 [SEMINAR UEBER NULSTELLENVERFAHREN UND ANWENDUNGEN, FRUEHJAHRSTRIMESTER 1983]
K. J. Schwenzfeger, ed. Jan. 1984 225 p refs Sem. held at Munich, 1983
Avail: NTIS HC A10/MF A01

Zero point procedures and their applications are presented. Topics discussed include: nonlinear equations in parabolic differential equations and differential equation systems; similarity transformations of the Euler equations and numerical evaluation; acceleration of convergence of a monotonously enclosing iteration method; interval iteration procedure; application of polynomial zeroing methods on algebraic eigenvalue problems; iterative solution of the three dimensional nonlinear potential equation of gas dynamics for supersonic flow. For individual titles, see N84-26305 through N84-26310.

N84-26305# Muenster Univ. (West Germany).
NONLINEAR EQUATION SYSTEMS FOR PARABOLIC DIFFERENTIAL EQUATIONS AND DIFFERENTIAL EQUATION SYSTEMS [NICHTLINEARE GLEICHUNGSSYSTEME BEI PARABOLISCHEN DIFFERENTIALGLEICHUNGEN UND DIFFERENTIALGLEICHUNGSYSTEMEN] c64
Ulrich Hornung *In* Hochschule der Bundeswehr Sem. on Zeroing Meth. and Appl., Spring Trimester, 1983 Jan. 1984 p 1-16 refs In GERMAN (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

The numerical solution of parabolic differential equations is made by implicit procedures. To solve nonlinear problems nonlinear equations must be solved and long time periods have to be covered to produce many equations. The effectiveness of numerical methods depends on whether the special characteristics of the basic problem is utilized. On the one hand, the equations have all similar structures and that by timely extrapolations good results are obtained. On the other hand, in specific application exceptions do occur, which necessitate the application of special procedures. It is concluded that the numerical analysis of nonlinear evolution process leads to many large nonlinear equation systems, and that the algorithmic efficiency depends on how much the structure of special problems are useful to numerical analysis. E.A.K.

N84-26306# Hochschule der Bundeswehr, Munich. (West Germany).
SIMILARITY TRANSFORMATIONS OF THE EULER EQUATIONS AND THEIR NUMERICAL EVALUATION c64
A. Eberle *In its* Sem. on Zeroing Meth. and Appl., Spring Trimester, 1983 Jan. 1984 p 17-80 refs (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

The EULER equations (EE) which are the translation of Newton's law to continuum mechanics are discussed. They are a first order system of hyperbolic nonlinear partial differential equations the numerical solution of which is hard since the equations do not contain damping terms, which means that any numerical perturbation by round off errors or inconsistent algorithms remain undamped in the iterative solution process and is frequently amplified which spoils the final result. To distort the basic equations by tricky introduced damping terms to stabilize the solution process while reducing the truncation error at an amount as small as possible was tried. The eigenvalue decomposition of the EE which is an extended concept of the method of characteristics is one method that was used. A guide of several possibilities how to do

this is presented. A numerical scheme exploiting matrix viscosity splitting derived from the above considerations is proposed. E.A.K.

N84-26307# Karlsruhe Univ. (West Germany). Inst. fuer Angewandte Mathematik.
A DEVICE FOR THE ACCELERATION OF CONVERGENCE OF A MONOTONOUSLY ENCLOSING ITERATION METHOD c67
H. Cornelius and G. Alefeld *In* Hochschule der Bundeswehr Sem. on Zeroing Meth. nd Appl., Spring Trimester, 1983 Jan. 1984 p 81-93 refs (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

A class of iteration methods for solving simultaneous systems of nonlinear equations was considered. These methods compute in each iteration step lower and upper bounds for all components of the unknown solution vector. The main advantage of the methods is that certain classes of problems are convergent to the solution under weaker conditions than known methods which also enclose the solution monotonously. A simple device for constructing a sequence of real vectors which is faster convergent to the solution than the bounds of the enclosing vectors is discussed. E.A.K.

N84-26308# Technische Univ., Clausthal-Zellerfeld (West Germany).
INTERNAL ITERATION METHODS [INTERVAL-LITERATIONSVERFAHREN] c67
Rudolf Krawczyk *In* Hochschule der Bundeswehr Sem. on Zeroing Meth. and Appl., Spring Trimester, 1983 Jan. 1984 p 94-155 refs In GERMAN (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

The mathematical problem to solve the 8(x) = 0, equation was determined. The treatment of this problem is important for numerical mathematics. Methods discussed include: basics and designations; general intervals; interval-Newton theory; interval extention of Newton transforms. Transl. by E.A.K.

N84-26309# Mainz Univ. (West Germany). Fachbereich Mathematik.
REMARKS CONCERNING THE APPLICATION OF POLYNOMIAL ZEROING METHODS ON THE ALGEBRAIC EIGENVALUE PROBLEM [BEMERKUNGEN ZUR ANWENDUNG VON POLYNOMNULLSTELLENMETHODEN AUF DAS ALGEBRAISCHE EIGENWERTPROBLEM] c64
Wilhelm Werner *In* Hochschule der Bundeswehr Sem. on Zeroing Meth. and Appl., Spring Trimester, 1983 Jan. 1984 p 156-169 refs In GERMAN (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

The development of the LR-algorithm, and the GR-algorithms, the eigenvalue of the zero position of the typical polynomial had to be calculated to solve eigenproblems of nonsymmetric matrices numerically. The confidence in these methods is permanently supported by a Wilkinson theory, which has become a standard example in numerical mathematics. Transl. by E.A.K.

N84-26310# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
ITERATIVE SOLUTION OF THE THREE-DIMENSIONAL NONLINEAR POTENTIAL EQUATION OF THE GAS DYNAMCIS FOR ULTRASONIC FLOWS [ITERATIVE LOESUNG DER 3-D NICHTLINEAREN POTENTIALGLEICHUNG DER GASDYNAMIK FUER UEBERSCHALLSTROEMUNGEN] c64
C. Weiland *In* Hochschule der Bundeswehr Sem. on Zeroing Meth. and Appl., Spring Trimester, 1983 Jan. 1984 p 170-220 refs In GERMAN (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

The calculation of three dimensional flow fields, caused by circulation around bodies is outlined. A procedure to integrate the Euler equations is presented. The need to develop a numerical procedure for the solution of the whole potential equation is discussed. The three dimensional potential equation assumes the description of cylindrical coordinates which is indicated for random general coordinates. The commonality between the nonconservative and the conservative formulas is outlined. The numerical approximation of the formulated potential equations was developed and the necessary diffusion terms, by adding an artificial compressibility, are introduced. The boundary conditions and the numerical coordinate system are discussed. The numerical approximation of the potential equation is solved by a factorization method. Transl. by E.A.K.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N84-26311# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OPTIMAL DESIGN OF A STORAGE SYSTEM WITH CONSTANT OR LINEAR RELEASE RATE
Paulo Renato deMorais May 1984 9 p refs Submitted for publication
(INPE-3125-PRE/516) Avail: NTIS HC A02/MF A01

The determination of the optimal release rate for a continuous storage system is described. The input to the store is assumed to be a compound Poisson process (with non-negative jumps), and its content is release either at a constant rate or at a linear rate. Rewards are collected at an output-dependent rate and are continuously discounted at a constant rate. The problem consists in finding the optimal release rate which maximizes the infinite horizon expected discounted return. This problem is solved by deriving an explicit solution for the expected discounted return, from which the optimal release rate found. Author

N84-26312*# Notre Dame Univ., Ind. Dept. of Electrical Engineering.
CUT-OFF RATE CALCULATIONS FOR THE OUTER CHANNEL IN A CONCATENATED COOLING SYSTEM
Mark A. Herro, Daniel J. Costello, Jr., and Laizhao Hu [1984] 5 p refs
(Contract NCA2-IR562-401; Grant NAG5-234)
(NASA-CR-173612; NAS 1.26:173612) Avail: NTIS HC A02/MF A01 CSCL 09B

Concatenated codes were long used as a practical means of achieving long block or constraint lengths for combating errors on very noisy channels. The inner and outer encoders are normally separated by an interleaver, so that decoded error bursts coming from the inner decoder are randomized before entering the outer decoder. The effectiveness of this interleaver is examined by calculating the cut-off rate of the outer channel seen by the outer decoder with and without interleaving. Interleaving never hurts the performance of a concatenated code, and when the inner code rate is near the cut-off rate of the inner channel, interleaving significantly improves code performance. Author

N84-26313*# Illinois Inst. of Tech., Chicago. Dept. of Electrical and Computer Engineering.
ON THE UNDETECTED ERROR PROBABILITY OF A CONCATENATED CODING SCHEME FOR ERROR CONTROL
Huijie Deng and Daniel J. Costello, Jr. Jun. 1984 10 p refs
(Grant NAG5-234)
(NASA-CR-173613; NAS 1.26:173613) Avail: NTIS HC A02/MF A01 CSCL 09B

Consider a concatenated coding scheme for error control on a binary symmetric channel, called the inner channel. The bit error rate (BER) of the channel is correspondingly called the inner BER, and is denoted by Epsilon (sub i). Two linear block codes, C(sub f) and C(sub b), are used. The inner code C(sub f), called the frame code, is an (n,k) systematic binary block code with minimum distance, d(sub f). The frame code is designed to correct + or fewer errors and simultaneously detect gamma (gamma > +) or fewer errors, where + + gamma + 1 = to or < d(sub f). The outer code C(sub b) is either an (n(sub b), K(sub b)) binary block with a n(sub b) = mk, or an (n(sub b), k(Sub b) maximum

distance separable (MDS) code with symbols from GF(q), where q = 2(b) and the code length n(sub b) satisfies n(sub)(b) = mk. The integerim is the number of frames. The outercode is designed for error detection only. Author

N84-26314# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Informatique.
[ACTIVITIES REPORT OF THE COMPUTER DEPARTMENT] Annual Report, 1982 - 1983
Oct. 1983 99 p refs In FRENCH
(ENST-D-8303) Avail: NTIS HC A05/MF A01

The objectives and content of courses offered to those interested in designing and installing information systems for users are described as well as opportunities for those interested purely in the design of such systems. Research projects and accomplishments in informatics in 1982 are reviewed and publications generated from 1979 to 1983 are listed. Theses completed or in preparation are included. Transl. by A.R.H.

N84-26315# Fraunhofer-Inst. fuer Informations- und Datenverarbeitung, Karlsruhe (West Germany).
IMPROVING THE LEGIBILITY OF COMPUTER PRINTOUTS Final Report, Dec. 1982
Rudolf Haller, Dirk-Michael Harmsen, and Hans-Joachim Reinig Bonn Bundesministerium fuer Forschung und Technologie Mar. 1984 140 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-DV-84-001; ISSN-0170-9011) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 29,50

An often heard complaint is that computer printouts are difficult to read. From literature and with experimental studies the reasons are investigated showing possibilities for improvement. As an example, bills of electricity works are analyzed. Important for the increase of acceptance are improvements in the perceptability and coding of information especially the use of a suitable kind of organization of the information. Laser-printers as important printer systems in the future are discussed under these aspects. Author

N84-26316# California Univ., Los Angeles. Dept. of Computer Science.
SECURE RELIABLE PROCESSING SYSTEMS Final Technical Report, 1 Jul. 1977 - 31 Mar. 1982
G. J. Popek 21 Feb. 1984 160 p
(Contract MDA903-77-C-0211; ARPA Order 3396)
(AD-A140150; UCLA-CSD-840228) Avail: NTIS HC A08/MF A01 CSCL 09/2

This technical report covers research carried out by the Secure Distributed Processing Systems group at UCLA under ARPA sponsorship during the approximately five year period 1977-1982. The research conducted during that period focussed on two broad areas: computer security and distributed computer systems. The security work primarily made advances in networks, operating systems, and data management. The distributed systems research was oriented toward systems and software structures suitable for computers connected by local area networks. That work both developed the essential principle of network transparency, which largely eliminates machine boundaries from concern to programs and people, and produced an early prototype of a distributed operating system to demonstrate the feasibility of this principle and other architectural approaches. GRA

N84-26317*# Mitre Corp., McLean, Va.
GUIDELINES FOR DEVELOPING NASA (NATIONAL AERONAUTICS AND SPACE ADMINISTRATION) ADP SECURITY RISK MANAGEMENT PLANS Final Report
Frederick G. Tompkins Aug. 1983 60 p refs
(Contract NASw-3425)
(NASA-CR-173564; NAS 1.26:173564; PB84-171321;
MTR-83W123) Avail: NTIS HC A04/MF A01 CSCL 09B

This report presents guidance to NASA Computer security officials for developing ADP security risk management plans. The six components of the risk management process are identified and discussed. Guidance is presented on how to manage security risks that have been identified during a risk analysis performed at a data processing facility or during the security evaluation of an application system. GRA

N84-26318*# Mitre Corp., McLean, Va.
GUIDELINES FOR DEVELOPMENT OF NASA (NATIONAL AERONAUTICS AND SPACE ADMINISTRATION) COMPUTER SECURITY TRAINING PROGRAMS Final Report
Frederick G. Tompkins May 1983 50 p refs
(Contract NASw-3425)
(NASA-CR-173562; NAS 1.26:173562; PB84-171339;
MTR-83W68) Avail: NTIS HC A03/MF A01 CSCL 09B

The report presents guidance for the NASA Computer Security Program Manager and the NASA Center Computer Security Officials as they develop training requirements and implement computer security training programs. NASA audiences are categorized based on the computer security knowledge required to accomplish identified job functions. Training requirements, in terms of training subject areas, are presented for both computer security program management personnel and computer resource providers and users. Sources of computer security training are identified.
Author (GRA)

N84-25897*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Radio Frequency and Microwave Subsystem Section.
DSS 13 MICROPROCESSOR ANTENNA CONTROLLER
R. M. Gosline *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 64-74 (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 09B

N84-25903*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Office of Telecommunications and Data Acquisition.
MINIMUM-DISTANCE PROBLEMS IN PROTOCOL DESIGN
E. C. Posner and Z. Reichstein (California Inst. of Technology) *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 136-143 (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 09B

N84-26359# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Mathematische Maschinen und Datenverarbeitung (Informatik 3).
THESES AND REMARKS OF FUTURE DEVELOPMENT OF CALCULATORS [THESEN UND ANMERKUNGEN ZUR KOENFTIGEN RECHNER-ENTWICKLUNG]
Wolfgang Haendler *In* Hochschule der Bundeswehr Conf. on Vector Calculators, Winter Quarter 1983 Jan. 1984 p 72-108 refs In GERMAN (For primary document see N84-26355 16-64)
Avail: NTIS HC A07/MF A01

N84-26360# Kernforschungsanlage, Juelich (West Germany). Zentralinst. fuer Angewandte Mathematik.
PARALLEL PROCESSORS: ASPECTS OF INTERACTION BETWEEN CALCULATOR ARCHITECTURE AND ALGORITHMS [PARALLELPROZESSOREN: ASPEKTE DER WECHSELWIRKUNG ZWISCHEN RECHNERARCHITEKTUR UND ALGORITHMEN]
F. Hossfeld *In* Hochschule der Bundeswehr Conf. on Vector Calculators, Winter Quarter 1983 Jan. 1984 p 109-139 refs In GERMAN (For primary document see N84-26355 16-64)
Avail: NTIS HC A07/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-26319*# Illinois Univ., Urbana. Dept. of Computer Science.
THE EMBEDDED OPERATING SYSTEM PROJECT Mid-Year

Interim Report
Roy H. Campbell May 1984 192 p refs
(Grant NsG-1471)
(NASA-CR-173438; NAS 1.26:173438) Avail: NTIS HC A09/MF A01 CSCL 09B

This progress report describes research towards the design and construction of embedded operating systems for real-time advanced aerospace applications. The applications concerned require reliable operating system support that must accommodate networks of computers. The report addresses the problems of constructing such operating systems, the communications media, reconfiguration, consistency and recovery in a distributed system, and the issues of realtime processing. A discussion is included on suitable theoretical foundations for the use of atomic actions to support fault tolerance and data consistency in real-time object-based systems. In particular, this report addresses: atomic actions, fault tolerance, operating system structure, program development, reliability and availability, and networking issues. This document reports the status of various experiments designed and conducted to investigate embedded operating system design issues. B.W.

N84-26320# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
AUTOMATIC, SELF-NULLING, SPECTRAL SCANNING ELLIPSOMETER: SOFTWARE FOR THE LSI-11 DATA ACQUISITION SYSTEM
R. H. Muller and J. C. Farmer Feb. 1983 339 p
(Contract DE-AC03-76SF-00098)
(LBL-15525) Avail: NTIS HC A15/MF A01

The automatic, magneto-optic ellipsometer reported previously (1) has been given spectral scanning capabilities in the visible-UV, and has been interfaced to an LSI-11/2 for data acquisition. FORTRAN software is documented for the acquisition of both fixed wavelength and spectroscopic data from an automatic, self-nulling ellipsometer by a LSI-11 microcomputer. This ellipsometer has resulted from the addition of spectral scanning capabilities over the visible-UV to a previously reported (1) automatic, magneto-optic instrument. Additional programs are presented to aid in the interpretation of the acquired ellipsometry data. Software is categorized as being for either (a) fixed-wavelength data collection; (b) spectroscopic data collection, reduction, and simulation; (c) graphics; or (d) modeling and optimization. Author

N84-26321# Materials Research Labs., Melbourne (Australia).
SPEEDING UP THE HELP HYDRODYNAMIC CODE
David L. Smith May 1984 32 p refs
(MRL-R-925; AR-003-907) Avail: NTIS HC A03/MF A01

The Eulerian hydrodynamic code HELP has been employed at MRL for some years to model problems in warhead research. One disadvantage of HELP has been the long computer run-times associated with its use. This report describes a modification to the code which makes it run up to three times faster. Author

N84-26322# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROGRAMMING LANGUAGE LANAC 2 AND IMPLEMENTATION FOR A SISCO MB-8000 M.S. Thesis, 21 Dec. 1983 [PROJETO DA LINGUAGEM LANAC-II E A SUA IMPLEMENTACAO PARA O SISCO MB-8000]
Sergio Donizetti Fischer Apr. 1984 157 p refs In PORTUGUESE; ENGLISH summary
(INPE-3090-TDL/163) Avail: NTIS HC A08/MF A01

The specification and implementation of LANAC-II, the second version of the Algol-like programming language LANAC, are presented. Both of the versions are intended for concurrent programming and were developd at INPE/CNPq. LANAC-II is designed primarilly for dedicted computer systems, involving only one processor, especially those with real time and process control characteristics. The language aims at making possible to write more reliable programs, which are also more readable and maintainable. LANAC-II is a nonrecursive language and, besides the Algol 60 structure, also has a statement to express concurrency, semaphores for process communication and synchronization, and a special construct to create critical regions. In order to implant it in a SISCO MB-8000 minicomputer, a cross-compiler was writtern in Burroughs Extended Algol (B-6800 computer) to generate absolute assembly code, using quadruples as intermediate code. The language also needs a kernel - 'Cerne' - to support it. This report defines the basic requirements of this kernel and the first specification of its primitives. Author

N84-26323*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEASURES AND METRICS FOR SOFTWARE DEVELOPMENT
Mar. 1984 82 p refs
(NASA-TM-85605; SEL-83-002; NAS 1.15:85605) Avail: NTIS HC A05/MF A01 CSCL 09B

The evaluations of and recommendations for the use of software development measures based on the practical and analytical experience of the Software Engineering Laboratory are discussed. The basic concepts of measurement and system of classification for measures are described. The principal classes of measures defined are explicit, analytic, and subjective. Some of the major software measurement schemes appearing in the literature are derived. The applications of specific measures in a production environment are explained. These applications include prediction and planning, review and assessment, and evaluation and selection. R.J.F.

N84-26324*# North Carolina State Univ., Raleigh. Dept. of Computer and Electrical Engineering.
AN EVALUATION OF THE DIRECTED FLOW GRAPH METHODOLOGY Final Report
Wesley E. Snyder and Sarah A. Rajala May 1984 61 p Original contains color illustrations
(Grant NAG1-20)
(NASA-CR-173593; NAS 1.26:173593) Avail: NTIS HC A04/MF A01 CSCL 09B

The applicability of the Directed Graph Methodology (DGM) to the design and analysis of special purpose image and signal processing hardware was evaluated. A special purpose image processing system was designed and described using DGM. The design, suitable for very large scale integration (VLSI) implements a region labeling technique. Two computer chips were designed, both using metal-nitride-oxide-silicon (MNOS) technology, as well as a functional system utilizing those chips to perform real time region labeling. The system is described in terms of DGM primitives. As it is currently implemented, DGM is inappropriate for describing synchronous, tightly coupled, special purpose systems. The nature of the DGM formalism lends itself more readily to modeling networks of general purpose processors. R.S.F.

N84-26325*# Notre Dame Univ., Ind. Dept. of Electrical Engineering.
FAST DECODING TECHNIQUES FOR EXTENDED SINGLE-AND-DOUBLE-ERROR-CORRECTING REED SOLOMON CODES
Daniel J. Costello, Jr., Huijie Deng (Illinois Inst. of Technology, Chicago), and Shu Lin (Hawaii Univ., Honolulu) Jan. 1984 4 p refs Presented at the 18th Ann. Conf. on Inform. Sci. and Systems, Jan. 1984
(Grant NAG2-202)
(NASA-CR-173617; NAS 1.26:173617) Avail: NTIS HC A02/MF A01 CSCL 09B

A problem in designing semiconductor memories is to provide some measure of error control without requiring excessive coding overhead or decoding time. For example, some 256K-bit dynamic random access memories are organized as 32K x 8 bit-bytes. Byte-oriented codes such as Reed Solomon (RS) codes provide efficient low overhead error control for such memories. However, the standard iterative algorithm for decoding RS codes is too slow for these applications. Some special high speed decoding techniques for extended single and double error correcting RS codes. These techniques are designed to find the error locations and the error values directly from the syndrome without having to form the error locator polynomial and solve for its roots. Author

N84-26326*# Illinois Inst. of Tech., Chicago. Dept. of Electrical Engineering.
FAST DECODING OF A d(MIN) = 6 RS CODE
Huijie Deng and Daniel J. Costello, Jr. (Notre Dame Univ.) Dec. 1983 20 p refs
(Grant NAG2-202)
(NASA-CR-173620; NAS 1.26:173620) Avail: NTIS HC A02/MF A01 CSCL 09B

A method for high speed decoding a d sub min = 6 Reed-Solomon (RS) code is presented. Properties of the two byte error correcting and three byte error detecting RS code are discussed. Decoding using a quadratic equation is shown. Theorems and concomitant proofs are included to substantiate this decoding method. R.S.F.

N84-26327*# Illinois Inst. of Tech., Chicago. Dept. of Electrical Engineering.
AN EXTENDED d(MIN) = 4 RS CODE
Huijie Deng and Daniel J. Costello, Jr. Oct. 1983 7 p
(Grant NAG2-202)
(NASA-CR-173619; NAS 1.26:173619) Avail: NTIS HC A02/MF A01 CSCL 09B

A minimum distance d sub m - 4 extended Reed - Solomon (RS) code over GF (2 to the b power) was constructed. This code is used to correct any single byte error and simultaneously detect any double byte error. Features of the code; including fast encoding and decoding, are presented. R.S.F.

N84-26328*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A REPRESENTATIONAL BASIS FOR THE DEVELOPMENT OF A DISTRIBUTED EXPERT SYSTEM FOR SPACE SHUTTLE FLIGHT CONTROL
John J. Helly, Jr. (California Univ., Los Angeles), William V. Bates, Mel Cutler (Aerospace Corp.), and Steven Kelem May 1984 41 p refs
(NASA-TM-58258; S-533; NAS 1.15:58258) Avail: NTIS HC A03/MF A01 CSCL 09B

A new representation of malfunction procedure logic which permits the automation of these procedures using Boolean normal forms is presented. This representation is discussed in the context of the development of an expert system for space shuttle flight control including software and hardware implementation modes, and a distributed architecture. The roles and responsibility of the flight control team as well as previous work toward the development of expert systems for flight control support at Johnson Space Center are discussed. The notion of malfunction procedures as graphs is introduced as well as the concept of hardware-equivalence. Author

N84-26329# Instituto Quimico de Sarria, Barcelona (Spain).
CONSTRUCTION OF ENGINEERING DRAWINGS USING A PERSONAL COMPUTER [CONFECCION DE DIAGRAMAS DE INGENIERIA MEDIANTE UN ORENADOR PERSONAL]
Alberto Diaz Fernandez Jun. 1983 239 p refs In SPANISH
Avail: NTIS HC A11/MF A01

The use of the DIADEN program package, implemented on the Commodore CBM 4032 personal computer, for the construction of engineering drawings is proposed. The individual routines of the software package are described. M.G.

N84-26330# MATRA Espace, Paris-Velizy (France). Dept. Informatique-Automatique.
STATISTICAL METHODS OF PATTERN RECOGNITION [METHODES STATISTIQUES DE RECONNAISSANCE DES FORMES]
G. Gaillat 21 Feb. 1984 123 p refs In FRENCH
(ISBN-2-7225-0694-7) Avail: NTIS HC A06/MF A01

Form recognition, which seeks to reproduce on a machine all human activities related to preception by the five senses, is part of artificial intelligence. The history of attempts to simulate vision and voice is reviewed and applications in signal and image processing are listed. Statistical approaches described include: Bayes decision theorem, theorem of decision with cost, Bayes parametric approach, nonBayesian parametric approach, Bayes nonparametric methods, the method of Q plus next neighbor, and sequential decision making. Transl. by A.R.H.

N84-26331# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Informatique.
TOOLS TO AID IN IMPROVING SOFTWARE QUALITY: APPLICATION TO A STRUCTURAL EDITOR Thesis [OUTILS D'AIDE A L'AMELIORATION DE LA QUALITE DES LOGICIELS: APPLICATION A L'EDITEUR STRUCTUREL]
Jean-Marc Nerson Dec. 1983 338 p refs In FRENCH
(ENST-E-83013) Avail: NTIS HC A15/MF A01

The origins, properties and different types of software tools are defined and the notion of quality applied to software production is reviewed. Tools are grouped according to the principal questions they solve at the level of their use. The tools are then arranged in individual order by studying and summarizing each of their characteristics, functions, natures, availability, place in the process of elaborating of the software, and their contributions to the extension of the quality criteria. A full page structural editor (CEPAGE) is described. This prototype syntactic editor takes into account facilities for interacting with the terminal such as 1 mode full page, the use of choice menus, and the decomposition of the screen as a work zone. This tool permits construction and modification of the program through knowledge of syntactic structures. The system works on the syntactic tree of the program to be edited. Visualization is operated according to a mode interpreted by surveying a syntactic graph describing the grammar of the language and by applying an identification and elision algorithm while considering the limitations of lines and of columns on the terminal screen. Transl. by A.R.H.

N84-26332# Research Inst. of National Defence, Stockholm (Sweden).
TRAVEL REPORT FROM THE FIRST INTERNATIONAL PROGRAMMING CONFERENCE
Birgitta Spiridon Nov. 1983 16 p In SWEDISH; ENGLISH summary
Conf. held in Marseille, Sep. 1982
(FOA-C-20520-D8; ISSN-0347-3694) Avail: NTIS HC A02/MF A01

An overview of logic programming is given including theoretical aspects and applications. Presentations summarized include: logic programming in the second decade; a fifth generation computer project in Japan; applications of PROLOG in Hungary; LDM, a program specification support system; a LISP-machine to implement PROLOG; an interpretation algorithm for PROLOG programs; adding redundancy to obtain more reliable and more readable PROLOG programs; logic programming: a parallel approach; concurrent execution of logic; PROLOG in the industry; restriction grammar in PROLOG; and towards a derivation editor.
Transl. by A.R.H.

N84-26333# European Space Agency, Paris (France).
SIMULATION OF LINEAR MULTIVARIABLE SYSTEMS WITH PIECEWISE CONTINUOUS INPUT FUNCTIONS AND WITH VARIOUS OPTIONS FOR GRAPHIC REPRESENTATION OF THE RESULTS
Josef Petry Nov. 1983 127 p refs Transl. into ENGLISH of "Simulation linearer mehrgroessensysteme mit abschnittweise eingangsfunktionen und verschiedenen moeglichkeiten der frafischen ergebnisdarstellung" rept. DFVLR-Mitt-81-23 DFVLR, Oberpfaffenhofen, West Germany, Sep. 1981
(ESA-TT-749; DFVLR-Mitt-81-23) Avail: NTIS HC A07/MF A01; original German report available from DFVLR, Cologne DM 27

A FORTRAN member of the program library RASP (Regulation Analysis and Synthesis Programs) for the digital simulation of linear multi-variable systems is presented. Input functions which can be modelled as solutions of ordinary homogeneous linear differential equations with constant coefficients can be used. Only piecewise continuity is assumed. Efficient subroutines are provided for the numerical and/or graphic representation of results. Author

N84-26334# Stanford Univ., Calif. Computer Systems Lab.
ADA ADVANCED ERROR DETECTOR Final Technical Report, Nov. 1979 - Nov. 1982
D. C. Luckham Griffiss AFB, N.Y. RADC Jan. 1984 64 p
(Contract F30602-80-C-0022; AF Proj. 5581)
(AD-A140273; RADC-TR-83-299) Avail: NTIS HC A04/MF A01 CSCL 09/2

This is the final technical report on a project entitled 'Ada Advanced Error Detector.' The purpose of this project was to study techniques of detecting common runtime errors in sequential Ada at compile-time using verification techniques, high level annotation languages, and runtime detection of deadness errors in Ada tasking. This work has resulted in a working prototype implementation of a system for detecting and diagnosing tasking errors. GRA

N84-26335# Mitchell and Gauthier Associates, Huntsville, Ala.
ACSL (ADVANCED CONTINUOUS SIMULATION LANGUAGE) SIMULATION OF A THIRD ORDER BUTTERWORTH FILTER USING IMPLEMENTATIONS DERIVED FROM BOTH Z AND S DOMAIN REPRESENTATIONS Technical Report
E. E. L. Mitchell and D. B. Merriman Redstone Arsenal, Ala. Army Missile Command Feb. 1984 108 p
(Contract DAAK40-78-D-0010)
(AD-A140302; AD-E950504; DRSMI/RD-84-8-CR) Avail: NTIS HC A06/MF A01 CSCL 09/1

This report describes the implementation of a Third Order Butterworth filter in the ACSL. Observations and comparisons are made with inputs and outputs. Both plots of the S and Z transfer functions were made with an ACSL program. The program and Bode plots are both described in this report. Author (GRA)

N84-26336# Stanford Univ., Calif. Computer Systems Lab.
ANNOTATION LANGUAGE DESIGN FOR ADA (ANNA) Interim Report, Oct. 1980 - Sep. 1981
D. C. Luckham Griffiss AFB, N.Y. RADC Jan. 1984 64 p
(Contract F30602-80-C-0022; AF Proj. 5581)
(AD-A140452; RADC-TR-83-298) Avail: NTIS HC A04/MF A01 CSCL 09/2

This interim report covers research work on Annotation language design for Ada. The major goal of this research was the design and development of programming tools that may be incorporated into an Ada Programming Support Environment during the mid-1980's time frame. Since Ada is a very advanced language containing many essential new features such as tasking, and standard Ada tools such as compilers do not yet exist, the research has been structured so as to approach the major goal by first studying the error detection problem for subsets of Ada corresponding to already highly used languages such as Pascal. The error detection problem as an important starting point because this attempts to analyse programs for common errors without assuming that the programs have accompanying annotations. At the start of this project no formal annotation language for Ada existed. The second phase of the research effort was to design an annotation language for Ada, called ANNA. This would provide a basis for verification of Ada programs in general. This second report deals with the work on the design of ANNA. GRA

N84-26337# National Bureau of Standards, Washington, D.C. National Engineering Lab.
GUIDE TO AVAILABLE MATHEMATICAL SOFTWARE
R. F. Bolsvert, S. E. Howe, and D. K. Kahaner Jan. 1984 441 p refs
(PB84-171305; NBSIR-84-2824) Avail: NTIS HC A19/MF A01 CSCL 09B

The second edition of the Guide to Available Mathematical Software (GAMS) provides summary documentation of software available to NBS staff on a variety of computers. The fifteen libraries documented in GAMS are: BMDP, CMLIB, (containing three dozen public-domain packages), DATAPAC, IMSL, INVAR, MATHWARE, MATLAB, MINITAB, NAG, PDELIB, PLOD, PORT, SLDGL, SPECTRLAN, STATLIB. GAMS is based on an extensive problem-oriented scheme for classifying software for mathematical computations including special fucntions, linear algebra, optimization, differentiation and integration, differential and integral equations, and statistics and probability. The document contains the classification scheme, a catalog of software organized by class, a dictionary of the software, library references, and an index. GRA

N84-25976# International Business Machines S. A. E., Madrid (Spain). Scientific Center.
PLANNING AN EXPERIMENT FOR DIGITAL IMAGE PROCESSING
Javier Jimenez *In* Von Karman Inst. for Fluid Dyn. Digital Image Processing in Fluid Dyn. 1984 24 p refs (For primary document see N84-25973 16-34)
Avail: NTIS HC A19/MF A01

N84-26208# Systems Science and Software, La Jolla, Calif.
POLAR CODE DEVELOPMENT
I. Katz, D. L. Cooke, M. J. Mandell, D. E. Parks, J. R. Lilley, J. H. Alexander, and A. G. Rubin *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 321-332 (For primary document see N84-26185 16-46)
(Contract F19628-82-C-0081)
(AD-P002122) Avail: NTIS HC A18/MF A01 CSCL 09/2

N84-26209*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH VOLTAGE SOLAR ARRAY MODELS AND SHUTTLE TILE CHARGING
A. Rubin and N. J. Stevens *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 333-336 Prepared in cooperation with AFGL, Hanscom AFB, Mass. (For primary document see N84-26185 16-46)
(AD-P002123) Avail: NTIS HC A18/MF A01 CSCL 09B

N84-26214# Boston Coll., Chestnut Hill, Mass.
REQUIREMENTS FOR VALIDATING SYSTEM MODELS
M. S. Gussenhoven *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 407-415 refs (For primary document see N84-26185 16-46)
(Contracts F19628-82-K-0011; F19628-81-K-0032)
(AD-P002128) Avail: NTIS HC A18/MF A01 CSCL 09/2

N84-26446 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
ON VALIDATION OF MISSION SOFTWARE BY CLOSED-LOOP TESTING IN REALTIME
H. Neubauer *In its* Tech. and Sci. Publ. 1983 1983 p Presented at AGARD GCP 35th Panel Meeting/Symp. on Advan. in Guidance and Control Systems (CP-321), Lissabon, 11-15 Oct. 1982 (For primary document see N84-26430 16-81)
(MBB-UA-770-83-O) Avail: Issuing Activity

N84-26451 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
IMPORTANT CAD/CAM UTILIZATION AT MBB [CAD/CAM-GROSSANWENDUNG BEI MBB]
Volkmar Antl *In its* Tech. and Sci. Publ. 1983 1983 p 335-340 In GERMAN (For primary document see N84-26430 16-81)
(MBB-Z-13-83-O) Avail: Issuing Activity

62 COMPUTER SYSTEMS

Includes computer networks.

N84-26338# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TRENDS IN DATA COMMUNICATION BY COMPUTER NETWORKS IN SPACE MISSIONS [TENDENSIAS NA COMUNICACAO DE DADOS PARA REDES DE COMPUTADORES

EM MISSOES ESPACIAIS]
Eduardo Whitaker Gergamini Apr. 1984 15 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Simposio Brasileiro sobre Redes de Computadores, Campina Grande (Brazil), 16-18 Apr. 1984
(INPE-3068-PRE/485) Avail: NTIS HC A02/MF A01

Trends in the technique of data communications are examined which will influence the implementation of computer networks, and effect the conduct of space missions, in the next decade. The following aspects are considered: (1) telemetry and telecommand data communications; (2) standard data exchange among space agencies; and (3) aspects on the connection among their data communication networks. M.A.C.

N84-26339# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A PROBLEM IN THE OPTIMAL CONTROL OF QUEUEING WORKLOADS FOR THE M/G/1 FILE [UM PROBLEMA DE OTIMIZACAO EM CONTROLE DA QUANTIDADE DE TRABALHO ACUMULADO NUMA FILA M/G/1]
Antonio Fernando Branco Costa and Paulo Renato deMorais May 1984 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 6th Simposio Nac. de Probabilidade e Estatistica, Rio de Janeiro, 23-27 Jul. 1984
(INPE-3106-PRE/505) Avail: NTIS HC A02/MF A01

An M/G/1 queue with two available service rates and a controlled input is considered. At each instant of time, a decision has to be made about which service rate to use and whether the entrance to the system should be closed or not for new arrivals. This decision is based upon the residual workload at time t, X(t) compared with two critical numbers X(t) and k(2): when X(t) is less than k(1), the entrance to the system is kept open and the server uses the lowest service rate; when k(1) is less, the entrance is still kept open but the server uses the greatest service rate; when X(t) is greater than k(2), the entrance is kept closed and the server uses the greatest service rate. The cost structure includes customer's waiting costs, server's idleness costs, service rate switching costs, penalty costs due to lost customers, and rewards dependent upon the service rate being used. An expression for the average return per unit time is given, from which the optimal values of the critical levels can be found. Numerical results are given for the N/M/1 queue, and the results are compared with other models. M.A.C.

N84-26340*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN OPERATING SYSTEM FOR FUTURE AEROSPACE VEHICLE COMPUTER SYSTEMS
Edwin C. Foudriat, W. J. Berman (Advanced Programming Techniques, Inc.), Ralph W. Will, and W. L. Bynum (College of William and Mary) Apr. 1984 37 p refs
(NASA-TM-85784; NAS 1.15:85784) Avail: NTIS HC A03/MF A01 CSCL 09B

The requirements for future aerospace vehicle computer operating systems are examined in this paper. The computer architecture is assumed to be distributed with a local area network connecting the nodes. Each node is assumed to provide a specific functionality. The network provides for communication so that the overall tasks of the vehicle are accomplished. The O/S structure is based upon the concept of objects. The mechanisms for integrating node unique objects with node common objects in order to implement both the autonomy and the cooperation between nodes is developed. The requirements for time critical performance and reliability and recovery are discussed. Time critical performance impacts all parts of the distributed operating system; e.g., its structure, the functional design of its objects, the language structure, etc. Throughout the paper the tradeoffs - concurrency, language structure, object recovery, binding, file structure, communication protocol, programmer freedom, etc. - are considered to arrive at a feasible, maximum performance design. Reliability of the network system is considered. A parallel multipath bus structure is proposed for the control of delivery time for time critical messages. The architecture also supports immediate recovery for the time critical message system after a communication failure. Author

N84-26341# Navy Personnel Research and Development Center, San Diego, Calif.
MICROCOMPUTER NETWORK FOR COMPUTERIZED ADAPTIVE TESTING (CAT) Final Report, FY81 - 83
B. Quan, T. A. Park, G. Sandahl, and J. H. Wolfe Mar. 1984 133 p
(AF Proj. F63521)
(AD-A140256; NPRDC-TR-84-33) Avail: NTIS HC A07/MF A01 CSCL 05/10

Computerized adaptive testing (CAT) offers the opportunity to replace paper-and-pencil aptitude tests with shorter, more accurate, and more secure computer-administered tests. Its potential advantages needed to be verified by experimental administration of automated tests to military personnel whose subsequent training and job performance could be correlated with their CAT performance. A hardware and software system was developed for experimental administration of computerized aptitude tests to military personnel. A network of microprocessors was used, with each testing station including an Apple III personal computer. Eight such computers shared a 10-million byte Winchester disk containing the data base of items, programs, and examined records. This report contains the system documentation, and user documentation. GRA

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N84-26342# University of Southern California, Marina del Rey. Information Sciences Inst.
DISCOURSE STRUCTURES FOR TEXT GENERATION
W. C. Mann Feb. 1984 21 p
(Contract F49620-79-C-0181)
(AD-A140278; ISI/RR-84-127) Avail: NTIS HC A02/MF A01 CSCL 06/4

Text generation programs need to be designed around a theory of text organization. This paper introduces Rhetorical Structure Theory, a theory of text structure in which each region of text has a central nuclear part and a number of satellites related to it. A natural text is analyzed as an example, the mechanisms of the theory are identified, and their formalization is discussed. In a comparison, Rhetorical Structure Theory is found to be more comprehensive and more informative about text function than the text organization parts of previous text generation systems.
Author (GRA)

N84-26343# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
SIMULATION EXPERIMENTS WITH GOAL-SEEKING ADAPTIVE ELEMENTS Final Report, Jun. 1980 - Aug. 1983
A. G. Barto Wright-Patterson AFB, Ohio AFWAL Feb. 1984 165 p
(Contract F33615-80-C-1088; AF Proj. 2312)
(AD-A140295; AFWAL-TR-84-1022) Avail: NTIS HC A08/MF A01 CSCL 06/4

This report describes results obtained from computer simulation experiments designed to systematically develop and evaluate an approach to learning by networks of neuronlike adaptive elements. The characterizing feature of this approach is that the network components, or adaptive elements, are self-interested, goal-seeking agents that implement robust algorithms for furthering their individual interests. These algorithms combine stochastic search and associative learning methods. Results show how these adaptive elements can cooperate as components of layered networks that adaptively create new features by combining existing features. Other simulation experiments are described that systema-

ically examine the performance of individual adaptive elements in tasks that resemble the tasks faced by elements embedded within networks. The performances of a variety of algorithms are compared and contrasted. These results demonstrate the shortcomings of certain algorithms and the effectiveness of others. Experiments examine the effects on learning of delayed reinforcement. We justify the adaptive heuristic critic algorithm for reducing the severity of the temporal credit-assignment problem for tasks with delayed reinforcement. We illustrate the effectiveness of this algorithm in a task requiring the system to learn to control an unstable dynamical system under the influence of low-quality evaluative feedback. GRA

N84-26344# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE MULTIPLE DEVICE QUEUEING SYSTEM
D. P. Kingston, III and M. J. Muuss Feb. 1984 16 p
(DA Proj. 1L1-62618-AH-80)
(AD-A140429; AD-F300402; ARBRL-MR-03333) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Multiple Device Queueing System (MDQS) is designed to provide UNIX with a full function, modular, and consistent queueing system. The MDQS system has been designed with portability, expandability, robustness, and data integrity as key goals. MDQS is designed around a central queue which is managed by a single privileged daemon. Requests, delayed or immediate, are queued by non-privileged programs. Once queued, requests can be listed, modified or deleted. When the requested device or job stream becomes available, the daemon executes an appropriate server process to handle the request. Once activated, the request can still be canceled or restarted if needed. MDQS can serve as a delayed-execution/batch subsystem and replaces internally the functions of 1PR (I) and at(I) as a minimum. MDQS provides the system manager with a number of tools for managing the queueing system. Queues can be created, modified, or deleted without the loss of requests. MDQS recognizes and supports both multiple devices per queue and multiple queues per device by mapping input for a logical device to an appropriate physical output device. Anticipating the inevitable, MDQS also provides for crash recovery. The MDQS system has been developed at the U.S. Army Ballistic Research Laboratory by Doug Kingston and Michael Muuss to support the work of the laboratory and is available to other UNIX sites upon request. The MDQS system is designed to be compilable on a standard V7 UNIX system . GRA

N84-26345# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
RESEARCH IN ADAPTIVE CONTROL HYBRID AND CONSTRAINED STRUCTURE SYSTEMS Final Scientific Report, 1 May 1980 - 31 Aug. 1983
T. E. Djaferis 17 Oct. 1983 7 p
(Grant AF-AFOSR-0155-80; AF Proj. 2304)
(AD-A140496; AFOSR-83-1122TR) Avail: NTIS HC A02/MF A01 CSCL 05/1

Stable Hybrid Model Reference Adaptive Control Algorithms are suggested which are then extended to deal with the presence of bounded disturbances. The question of unmodelled dynamics is also addressed. Simpler adaptive control algorithms are developed in the context of pole placement, by first considering systems with known parameters. Such algorithms do not require a minimum phase assumption. The foundation is laid for a much broader investigation of robust design methods for systems with structured uncertainties. Author (GRA)

N84-25871# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ROBUSTNESS QUANTIFICATION FOR NONLINEAR SAMPLED-DATA SYSTEMS WITH DYNAMIC MULTIPLICATIVE PERTURBATIONS
Y. Joannic and O. Mercier *In its* La Rech. Aerospatiale, Bimonthly Bull., No. 1983-6, 217/Nov.-Dec. Apr. 1984 p 1-16 refs (For primary document see N84-25870 16-31)
Avail: NTIS HC A04/MF A01; HC available at ONERA, Paris FF 55; original report in FRENCH available at ONERA, Paris FF 60

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-26346 Bayerische Akademie der Wissenschaften, Munich (West Germany).
VARIANCE-COVARIANCE COMPONENTS ESTIMATION BY THE ADJUSTMENT OF HETEROGENEOUS REPETITION MEASUREMENTS Ph.D. Thesis - Bonn Univ. [VARIANZ-KOVARIANZ-KOMPONENTEN-SCHAETZUNG BEI DER AUSGLEICHUNG HETEROGENER WIEDERHOLUNGSMESSUNGEN]
Burkhard Schaffrin 1983 141 p refs In GERMAN
(Ser-C-282; ISBN-3-7696-9333-7; ISSN-0065-5325) Copyright. Avail: Issuing Activity

The dispersion component estimation theory and its calculation possibilities, especially as applied to geodesy is discussed. The covariance component estimator is a tool which in a single model analyzes heterogenous repetition measurements. The treatment of heterogeneous repeat measurements with multivariate methods has to be established by proving the optimization from a statistical point of view and examination of the computation possibilities and its effectiveness on various geodetic problems. E.A.K.

N84-26347# Iowa Univ., Maxwell.
MODIFICATION OF THE ETA-INVARIANT CODE FOR APPLICATION OF A MODULAR GRID NETWORK Final Report, 1 Apr. 1982 - 30 Mar. 1983
Richard G. Hindman Aberdeen Proving Ground, Md. Ballistic Research Lab. Nov. 1983 36 p refs
(Contract DAAG29-81-D-0100; DA Proj. 1L1-61102-AH-43)
(AD-A135817; ARBRL-CR-00520) Avail: NTIS HC A03/MF A01 CSCL 12/11

Extensive modifications to the eta-Invariant code for computation of tubular projectile flowfields are reported. An efficient modular grid network is implemented consisting of a find mesh near the projectile, a coarse mesh on the interior of the projectile, and a coarse mesh on the exterior region. The conventional implicit factored integration scheme in delta form is modified to allow for block tridiagonal inversion along a line which crosses from one mesh to another. Special intermesh operators are derived for implementation of this idea at the intermesh points and their immediate neighbors. Complex applications topology of various block inversions are discussed in detail. M.G.

N84-26348# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil). Dept. da Computacao Aplicada.
VIRTUAL Z-TREES: A BALANCING TECHNIQUE FOR MULTIWAY SEARCH TREES Thesis [Z-ARVORES VIRTUAIS: UMA TECNICA DE BALANCEAMENTO PARA ARVORES DE CAMINHOS MULTIPLOS]
Mirna Felicia R. de Oliveira Petrusanis May 1984 103 p refs In PORTUGUESE; ENGLISH summary
(INPE-3093-TDL/164) Avail: NTIS HC A06/MF A01

The first implementation and numerical evaluation of Z-Trees, which are multiway search trees similar to B-Trees are presented. In order to obtain low retrieval costs, the trees have to be kept balanced. This is done by a balancing technique, the Virtual Z-Tree Technique (VZTT). Compared to B-Trees, the VZTT has the advantages of low update costs and simple algorithms, which do not require overflow and underflow techniques. A disadvantage of the VZTT is the necessity of an approximate knowledge of the key distribution. Assuming that one node of a Z-Tree occupies one block, the mean block transfer rate is obtained by insertions and deletions of random keys. The block transfer rate for VZTT is of the order of B-Trees. The storage usage of VZTT is increasing by an adequate representation of the leaves, which requires division and junction techniques. With this leaf representation, the minimum

storage usage is 50% and in the simulation done of the order of 90%. Author

N84-26349# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPACTED VIRTUAL SEARCH TREE AND ADDRESSED ORDERED BINARY TREES FOR FILE ORGANIZATION M.S. Thesis [ARVORES DE PROCURA VIRTUAL COMPACTA E ARVORES BINARIAS COM ENDERECOS ORDENADOS PARA ORGANIZACAO DE ARQUIVOS]
Eliane Dippolito Apr. 1984 112 p refs
(INPE-3075-TDL/161) Avail: NTIS HC A06/MF A01

Two types of binary search trees were studied. First, Addressed Ordered Binary Trees using Virtual Trees for balancing were implemented with direct disc access. Simulations done on the CYBER 170/750 show a reduction of the block transfer rate of the order of 50% for realistic block sizes (500 bytes). Tests with a single user microcomputer with disquettes (blocksize about 128 bytes) show that 40% of the total search time is saved. The second binary search tree analized is the Compacted Virtual Search Tree (CVST). A CVST is basically a Virtual Binary Tree with additional leaves containing the actual keys and records. All internal nodes of a CVST have a degree of 2, which guarantees an optimal storage usage. The mean access number is slightly higher (about 2) than those of other balanced trees. Insertions and deletions (maintaining the tree structure) are very efficient (0.7/0.3 addicional write accesses por insertion/deletion). Author

N84-26350# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ON THE RELATIONSHIP BETWEEN GAUSSIAN AND BINOMIAL MODELS FOR IMAGE REGISTRATION BY SEQUENTIAL TESTS OF HYPHOTESES
Nelson D. A. Mascarenhas and Guaraci J. Erthal Mar. 1984 11 p refs Presented at the 15th Intern. Congr. of Photogrammetry and Remote Sensing, Rio de Janeiro, 17-29 Jun. 1984
(INPE-3047-PRE/470) Avail: NTIS HC A02/MF A01

A method for treating translational image registration problems by sequential test of hyphoteses was presented. Two types of statistical models were used then to describe the images to be registered, namely, a Gaussian and a binomial model. The proposed method successfully registered a LANDSAT image against noisy versions of itself, different channels of the same image, as well as images taken six months apart. Relationships between both models are established. First, by assuming that both images to be registered are Gaussian and one image is essentially a noisy version of the other, and that both images are threshold at the mean value, a derivation is made of the probability curve of the binary error being equal to one, at the registration point, versus the signal to noise ratio. Second, assuming that the cross-correlation between the signals in both images is markovian and separable, the set of probability curves of the binary error being equal to one versus the distance from registration point is derived. Author

N84-26351*# National Aeronautics and Space Administration, Washington, D. C.
ANALYTICAL SOLUTION OF 1ST AND 2ND ORDINARY DIFFERENTIAL EQUATIONS USING THE REDUCE 2 ALGEBRA MANIPULATION PROGRAM
Guilherme Bittencourt and Luiz Alberto Vierira Dias Apr. 1984 16 p refs Transl. into ENGLISH of "Solucao analitica de equacoes diferenciais ordinarias de primerira e segunda ordem utilizando o programa de manipulacao algebrica REDUCE-2" rept. INPE-2719-PRE/305, Sao Jose dos Campos, Brazil, Apr. 1983 18 p Presented at the 3d Simp. Castelan em Mat. Appl., Florianapolis, Brazil Original language doc. announced as N83-31389 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Inst. de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
(Contract NASw-3542)
(NASA-TM-77446; NAS 1.15:77446; INPE-2719-PRE/305) Avail: NTIS HC A02/MF A01 CSCL 12A

Computer solutions for differential equations normally are obtained numerically. However, there are cases in which the clarity of a closed form analitical presents overwhelming advantages over a table of values. The algebraic manipulation capabilities of the computer program REDUCE 2 are explored. In addition to these capabilities, procedures that are able to interpret a given ordinary differential equation, written, as long as possbile in the usual mathematical notation are implemented. Using a heuristic algorithm, similar to the way an advanced calculus student would approach the problem, the solution is assembled, according to the best method for each case. Once in integral form, the REDUCE 2 integrator tries to solve it, obtaining an analitical solution formula. Besides finding the solution, the equation is classified (order, linearity, method used, integration factor), and the solution type described (explicit or implicit). Error and follow-up messages are activated, as necessary. The input may be by interactive remote terminal or by cards (batch). R.J.F.

N84-26352*# Bendix Corp., Teterboro, N. J. Guidance Systems Div.
MODULAR DESIGN ATTITUDE CONTROL SYSTEM Final Report, 1 Nov. 1982 - 30 Sep. 1983
F. D. Chichester [1983] 71 p refs
(Contract NAS8-33979)
(NASA-CR-173684; NAS 1.26:173684) Avail: NTIS HC A04/MF A01 CSCL 12A

The problem of applying modular attitude control to a rigid body - flexible suspension model of a flexible spacecraft with some state variables inaccessible was addressed by developing a sequence of single axis models and generating a series of reduced state linear observers of minimum order to reconstruct those scalar variables that were inaccessible. The specific single axis models treated consisted of two, three and four rigid bodies, respectively, interconnected by a flexible shaft passing through the mass centers of the bodies. Reduced state linear observers of all orders up to one less than the total number of scalar state variables were generated for each of the three single axis models cited. Author

N84-26353*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODIFICATION TO SHOCK FITTING PROGRAM
M. H. Acuna and R. P. Lepping Apr. 1984 12 p refs
(NASA-TM-86097; NAS 1.15:86097) Avail: NTIS HC A02/MF A01 CSCL 12A

A modified form of the Lepping - Argentiero single spacecraft, shock normal determination procedure is presented. The modified method incorporates a simple predictor-corrector algorithm which allows a faster convergence rate and the use of average values of the parameters for the starting vector. Author

N84-26354# National Aerospace Lab., Tokyo (Japan).
SOME METHODS FOR NUMERICAL CONFORMAL MAPPING
Kenji Inoue and Takashi Nakamura Dec. 1983 6 p refs
(NAL-TR-794T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Methods are proposed to determine numerically the transformation functions which map (1) the domain on the x + iy = z-plane bounded by two periodic functions Y sub 1 (x) and Y sub 2 (x) with a common period onto an infinite strip -P < or = eta < or = P on xi + i(eta) = zeta-plane eta < or = O. These methods are also applicable to the conformal mapping of (3) the doubly connected region bounded by two concentric closed curves and (4) regions exterior or interior to a closed curve. R.S.F.

N84-26355# Hochschule der Bundeswehr, Munich. (West Germany). Forschungsschwerpunkt Simulation und Optimierung Deterministischer und Stochastischer Dynamischer Systeme.
CONFERENCE ON VECTOR CALCULATORS, WINTER QUARTER 1983 [SEMINAR UEBER VEKTORRECHNER, WINTERTRIMESTER 1983]
Jan. 1984 145 p refs In GERMAN Conf. held at Munich, 1983
Avail: NTIS HC A07/MF A01

Vector calculators were discussed. Topics treated are: numerical mathematics by vector calculators; application possibilities of

the ICL DAP; implementation flow mechanics computer programs; future computer development; and parallel processors, aspects of the interaction between computer architecture and algorithms. For individual titles, see N84-26356 through N84-26360. E.A.K.

N84-26356# Technische Univ., Brunswick (West Germany). Inst. fuer Rechentechnik.
NUMERICAL MATHEMATICS BY VECTOR CALCULATION: THEORY AND PRACTICAL EXPERIMENTS [NUMERISCHE MATHEMATIK AUF VEKTORRECHNERN: THEORIE UND PRAKTISCHE ERFAHRUNDGEN]
M. Feilmeier *In* Hochschule der Bundeswehr Conf. on Vector Calculators, Winter Quarter 1983 Jan. 1984 p 1-32 refs In GERMAN (For primary document see N84-26355 16-64)
Avail: NTIS HC A07/MF A01

Numerical analysis by vector calculation, in theory and practice, are outlined. Topics discussed include (1) application of parallel computing in corresponding numericals and computers, efficiency of arrays and vector calculators efficiency of algorithms; (2) elements of parallel numericals, numerical stability, principles in the construction of parallel algorithms, commonality between numerical stability and calculation speed, comparison between calculation time of FORTRAN, assembly and optimal assembly codes; (3) vectorization of finite element method, structural mechanics, sequential calculation time analysis, vectorized FEM solution of elastomechanical problems, and vectorized FLM solution of elastoplasticity problems. E.A.K.

N84-26357# Hohenheim Univ., Stuttgart (West Germany). Rechenzentrum.
POSSIBILITIES OF USING ICL: DISTRIBUTED ARRAY PROCESSOR [EINSATZMOEGLICHKEITEN DES ICL DAP]
Hans Geidel *In* Hochschule der Bundeswehr Conf. on Vector Calculators, Winter Quarter 1983 Jan. 1984 p 33-53 refs In GERMAN (For primary document see N84-26355 16-64)
Avail: NTIS HC A07/MF A01

The development of computer systems is reviewed. The computer design follows two directions: the micro and minicomputer and the large computers. The new computer architecture allows a greater variety of programs. The distributed array processor is described and its new potentials are enumerated. E.A.K.

N84-26358# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Theoretische Stroemungsmechanik.
ON VECTOR CALCULATION OF MECHANIC FLOW COMPUTER PROGRAMS [IMPLEMENTIERUNG STROEMUNGSMECHANISCHER COMPUTER-PROGRAMME AUF VEKTORRECHNERN]
Wolfgang Gentzsch *In* Hochschule der Bundeswehr Conf. on Vector Calculators, Winter Quarter 1983 Jan. 1984 p 54-71 refs In GERMAN (For primary document see N84-26355 16-64)
Avail: NTIS HC A07/MF A01

Application of different computer techniques, especially parallel processing, or pipelining is outlined. The use of parallel programming in fluid dynamics is discussed. Methods used include: vectorization of serial algorithms and numerical use of the Navier-Stokes equation in flow mechanics. E.A.K.

N84-26359# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Mathematische Maschinen und Datenverarbeitung (Informatik 3).
THESES AND REMARKS OF FUTURE DEVELOPMENT OF CALCULATORS [THESEN UND ANMERKUNGEN ZUR KOENFTIGEN RECHNER-ENTWICKLUNG] **c60**
Wolfgang Haendler *In* Hochschule der Bundeswehr Conf. on Vector Calculators, Winter Quarter 1983 Jan. 1984 p 72-108 refs In GERMAN (For primary document see N84-26355 16-64)
Avail: NTIS HC A07/MF A01

The development and design of computer systems is discussed and the integrated switching circuits are emphasized. The application of microprocessors is outlined and computer architecture is examined. The increased efficiency and fault tolerance are examined. E.A.K.

N84-26360# Kernforschungsanlage, Juelich (West Germany). Zentralinst. fuer Angewandte Mathematik.
PARALLEL PROCESSORS: ASPECTS OF INTERACTION BETWEEN CALCULATOR ARCHITECTURE AND ALGORITHMS [PARALLELPROZESSOREN: ASPEKTE DER WECHSELWIRKUNG ZWISCHEN RECHNERARCHITEKTUR UND ALGORITHMEN] **c60**
F. Hossfeld *In* Hochschule der Bundeswehr Conf. on Vector Calculators, Winter Quarter 1983 Jan. 1984 p 109-139 refs In GERMAN (For primary document see N84-26355 16-64)
Avail: NTIS HC A07/MF A01

Parallel processors and parallel algorithms are discussed. Hardware, software, algorithms and processing design are presented. Topics discussed include: (1) complexity, computer time vs. dimension of problem; (2) pipelining; (3) parallel processor structure and problems of parallelization; (4) systolic arrays and systolic algorithms; (5) interconnecting networks. E.A.K.

N84-26361# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Direction des Structures.
THE PRINCIPLE OF VIRTUAL WORK AND ASSOCIATED VARIATIONAL PRINCIPLES
Roger Valid 1982 40 p refs In FRENCH; ENGLISH summary
Presented at Ispra Courses on Computation of Transient Fluid-Structures Probl., Ispra, Italy, 13-17 Oct. 1980 Report will also be announced as ESA-TT-873
(AD-B071515; ONERA-P-1982-1; ISSN-0078-379X; ESA-TT-873)
Avail: NTIS HC A03/MF A01 CSCL 12/1

After a brief review of the results provided by the principle of virtual work in Continuum Mechanics, and in particular by the primal principle, the various mixed, hybrid, or complementary energy principles are presented in the linear and then the nonlinear three-dimensional case. In addition, the various principles relating to the Kirchhoff-Love shells are studied in the nonlinear case. Some considerations rather important from the point of view of numerical applications are also mentioned. Finally, the classical criterion of static stability is extended to the whole family of these principles. M.G.

N84-26362# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
ON THE OPTIMALITY OF SOME SUBSET SELECTION PROCEDURES
L. Y. Leu Mar. 1984 18 p
(Contract N00014-75-C-0455)
(AD-A140180; TR-84-7) Avail: NTIS HC A02/MF A01 CSCL 12/1

As measures of goodness of a selection rule, usually two quantities, the probability of a correct selection and the expected size of the selected subset, are considered. Based on these two criteria, Gupta and Huang (1980) proved a theorem to derive a selection procedure with some optimality property. However, the theorem cannot be applied to the unequal sample sizes case. In this paper, its authors use a different method to generalize this theorem to the unequal sample sizes case. Also a dual problem is investigated. Also, they treat a selection procedure in terms of multiple tests. Based on this approach, an optimality result is derived. Author (GRA)

N84-26363# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MODELLING WITH INTEGER VARIABLES Ph.D. Thesis
J. K. Lowe 1984 176 p
(AD-A140212; AFIT/CI/NR-84-4D) Avail: NTIS HC A09/MF A01 CSCL 12/1

Representing nonlinear optimization problems as mixed-integer programs has largely been considered as: (1) an art with few unresolved theoretical issues, and (2) a fairly standard preprocessing routine when combined with several ad hoc modelling improvements which have evolved through computational experience. The more common avenue of research in mixed-integer programming has focused upon finding improved algorithms and heuristics to solve the problems, assuming a standard mixed-integer representation exists. This thesis takes a step backwards and

re-examines the theoretical issues and subtleties involved in representing problems with mixed-integer representations. GRA

N84-26364# Brown Univ., Providence, R. I. Center for Dynamical Systems.
APPROXIMATING MULTIPLE ITO INTEGRALS WITH BAND LIMITED PROCESSES
H. J. Kushner and H. Huang Oct. 1983 32 p
(Contract N00014-76-C-0279; Grants AF-AFOSR-0116-81; NSF ECS-81-05978; NSF ECS-82-11476; AF Proj. 2304)
(AD-A140417; LCDS-83-24; AFOSR-84-0285TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper is concerned with the problem of the approximation of Ito integrals using band limited processes. The problem is treated in the context of the theory of weak convergence of measures and the correction terms exhibited. The method is such that the conditions used can readily be weakened. An application to a likelihood functional and hypothesis testing problem is given. There, the weak convergence result (rather than mere convergence of finite dimensional distributions) is essential if the limit approximation is to make sense as an approximation to the likelihood functional. The correction terms depend only on the limit (as epsilon approaches limit of 0) of the correlation function of the (renormalized) n sub epsilon. GRA

N84-26365# New York Univ., New York. Courant Inst. of Mathematical Sciences.
ANNUAL REPORT ON GRANT AFOSR-80-0228 Report, for 1 Aug. 1982 - 31 Oct. 1983
G. C. Papanicolaou 31 Oct. 1983 15 p
(Grant AF-AFOSR-0228-80; AF Proj. 2304)
(AD-A140512; AFOSR-84-0290TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During this period the four investigators (two are graduate students) produced five papers and two lecture note series. Titles include, Bounds for effective parameters of heterogeneous media by analytic continuation, Gaussian beams and representation of the Greens function, Convection of microstructure, Diffusive behavior of a random walk in a random medium, Random wave processes, and two lecture note series, Diffusions and random walks in random media, and Macroscopic properties of composites, bubbly fluids, suspensions, and related problems. Work continues on algorithm design for and numerical study of the focusing singularity in nonlinear beams. Work also continues on the modeling of flows with microstructure. This report summarizes progress in these areas during the inclusive dates. Author (GRA)

N84-26071 Cologne Univ. (West Germany). Inst. of Mathematics.
ROBUST STATISTICAL METHODS
F. Goetze *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 23-28 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

N84-26078 Aalborg Univ. (Denmark). Lab. for Photogrammetry.
THE DANISH METHOD: EXPERIENCE AND PHILOSOPHY
T. Krarup and K. Kubik *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 131-134 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

N84-26188# York Univ., Downsview (Ontario). Dept. of Physics.
IS THERE A GOOD WAY TO MODEL SPACECRAFT CHARGING IN THE PRESENCE OF SPACE-CHARGE COUPLING, FLOW AND MAGNETIC FIELDS?
J. G. Laframboise *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 57-78 refs (For primary document see N84-26185 16-46)
(AD-P002102) Avail: NTIS HC A18/MF A01 CSCL 12/1

N84-26204# Systems Science and Software, La Jolla, Calif.
MECHANISMS THAT LIMIT POTENTIALS ON IONOSPHERIC SATELLITES
D. E. Parks and I. Katz *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 277-281 Previously announced in IAA as A84-12899 (For primary document see N84-26185 16-46)
(Contract F19628-82-C-0081)
(AD-P002118) Avail: NTIS HC A18/MF A01 CSCL 12/1

N84-26210*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SHEATH SHAPES: A 3-D GENERALIZATION OF THE CHILD-LANGMUIR SHEATH MODEL FOR LARGE HIGH-VOLTAGE SPACE STRUCTURES IN DENSE PLASMAS
L. W. Parker, E. G. Holeman, and J. E. McCoy *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 337-389 refs Prepared in cooperation with Parker (Lee W.), Inc., Concord, Mass. (For primary document see N84-26185 16-46)
(AD-P002124) Avail: NTIS HC A18/MF A01 CSCL 12A

N84-26260# Utah State Univ., Logan. Dept. of Mathematics.
FUZZY ALGORITHMS FOR PATTERN RECOGNITION
J. C. Bezdek *In* Naval. Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 69-119 (For primary document see N84-26257 16-48)
(Grant NSF MCS-80-02856)
(AD-P003119) Avail: NTIS HC A13/MF A01 CSCL 12/1

N84-26267# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
SPATIAL IMAGE PROCESSING MASKS FROM FREQUENCY DOMAIN SPECIFICATIONS
E. R. Meyer and R. C. Gonzalez *In* Naval. Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 237-247 (For primary document see N84-26257 16-48)
(AD-P003126) Avail: NTIS HC A13/MF A01 CSCL 12/1

N84-25983# Mississippi State Univ., Mississippi State. Dept. of Aerospace Engineering
GENERATION OF THREE DIMENSIONAL GRIDS THROUGH ELLIPTIC DIFFERENTIAL EQUATIONS
Z. U. A. Warsi *In* Von Karman Inst. of Fluid Dynamics Computational Fluid Dyn., Vol. 1 1984 71 p refs (For primary document see N84-25980 16-34)
(Grant AF-AFOSR-0185-80)
Avail: NTIS HC A19/MF A01

N84-26305# Muenster Univ. (West Germany).
NONLINEAR EQUATION SYSTEMS FOR PARABOLIC DIFFERENTIAL EQUATIONS AND DIFFERENTIAL EQUATION SYSTEMS [NICHTLINEARE GLEICHUNGSSYSTEME BEI PARABOLISCHEN DIFFERENTIALGLEICHUNGEN UND DIFFERENTIALGLEICHUNGEN UND DIFFERENTIALGLEICHUNGSSYSTEMEN]
In Hochschule der Bundeswehr Sem. on Zeroing Meth. and Appl., Spring Trimester, 1983 Jan. 1984 p 1-16 refs In GERMAN (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

N84-26306# Hochschule der Bundeswehr, Munich. (West Germany).
SIMILARITY TRANSFORMATIONS OF THE EULER EQUATIONS AND THEIR NUMERICAL EVALUATION
A. Eberle *In its* Sem. on Zeroing Meth. and Appl., Spring Trimester, 1983 Jan. 1984 p 17-80 refs (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

N84-26309# Mainz Univ. (West Germany). Fachbereich Mathematik.
REMARKS CONCERNING THE APPLICATION OF POLYNOMIAL ZEROING METHODS ON THE ALGEBRAIC EIGENVALUE PROBLEM [BEMERKUNGEN ZUR ANWENDUNG VON POLYNOMNULLSTELLENMETHODEN AUF DAS ALGEBRAISCHE EIGENWERTPROBLEM]
Wilhelm Werner *In* Hochschule der Bundeswehr Sem. on Zeroing Meth. and Appl., Spring Trimester, 1983 Jan. 1984 p 156-169 refs In GERMAN (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

N84-26310# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
ITERATIVE SOLUTION OF THE THREE-DIMENSIONAL NONLINEAR POTENTIAL EQUATION OF THE GAS DYNAMCIS FOR ULTRASONIC FLOWS [ITERATIVE LOESUNG DER 3-D NICHTLINEAREN POTENTIALGLEICHUNG DER GASDYNAMIK FUER UEBERSCHALLSTROEMUNGEN]
C. Weiland *In* Hochschule der Bundeswehr Sem. on Zeroing Meth. and Appl., Spring Trimester, 1983 Jan. 1984 p 170-220 refs In GERMAN (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-26366# California Univ., Livermore. Lawrence Livermore Lab.
EVALUATING THE RESPONSE OF COMPLEX SYSTEMS TO ENVIRONMENTAL THREATS: THE SIGMA 2 METHOD
G. C. Corynen May 1983 48 p refs
(UCRL-53399) Copyright. Avail: Issuing Activity

The SIGMA-PI method was developed to model and compute the probabilistic performance of systems that operate in a threatening environment. Although the vulnerability of complex systems to earthquakes and to electromagnetic threats such as EMP (electromagnetic pulse) are emphasized, the method applies in general to most large scale systems or networks that are embedded in a potentially harmful environment. Other methods exist for obtaining system vulnerability, but their complexity increases exponentially as the size of systems is increased. The complexity of the SIGMA-PI method is polynomial, and accurate solutions are possible for problems for which current methods require the use of rough statistical bounds, confidence statements, and other approximations. For super large problems, where the costs of precise answers may be prohibitive, a desired accuracy can be specified, and the SIGMA-PI algorithms will halt when that accuracy is reached. The results of a theoretical complexity analysis are summarized and the theory is validated with computer experiments conducted both on worst case academic problems and on more reasonable problems occurring in practice. This method was compared with the exact methods of Abraham and Nakazawa, and with current bounding methods. The computational eficiency and accuracy of SIGMA-PI is demonstrated. Author

N84-26367# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
BAYES-p* SUBSET SELECTION PROCEDURES FOR THE BEST POPULATION
S. S. Gupta and H. M. Yang Feb. 1984 36 p
(Contract N00014-75-C-0455)
(AD-A140179; TR-84-2) Avail: NTIS HC A03/MF A01 CSCL 12/1

Two new selection procedures, called nonrandomized and randomized Bayes-P* procedures are defined for selecting a small nonempty subset of k populations which contains the best population. It is shown that these procedures have some optimal properties. If we restrict attention to the class D(D*) of all nonrandomized (randomized) selection procedures, which satisfy the PP*-condition, that is the posterior probability of a correct selection, for any given observation X = x, is not less than P*, a predetermined number between 1/k and 1, then these two new selection procedures are shown also be be Bayes decision procedures in the class D and D* respectively, provided that some regularity conditions are satisfied. Robustness of these procedures and comparisons with some other selection procedures are studied by using Monte Carlo simulations. Author (GRA)

N84-26368# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
SUBSET SELECTION PROCEDURES: A REVIEW AND AN ASSESSMENT
S. S. Gupta and S. Panchapakesan Feb. 1984 77 p
(Contract N00014-75-C-0455)
(AD-A140266; AD-F300408; TR-84-4) Avail: NTIS HC A05/MF A01 CSCL 12/1

It is well over three decades since statistical inference problems were first posed in the now familiar selection and ranking framework. This paper deals with the subset selection theory mainly developed by Gupta and his associates. Our aim is to provide a historical perspective, and trace the major developments that took place in the subset selection theory over the years 1950 to 1980 which is divided into three periods representing early developments, years of main growth and years of further strides. We also discuss recent developments and briefly assess the impact of these developments of the users. Author (GRA)

N84-26369# Massachusetts Inst. of Tech., Cambridge.
NUMERICAL METHODS FOR BAYES SEQUENTIAL DECISION PROBLEMS
H. Chernoff and A. J. Petkau Jan. 1984 67 p
(Contract N00014-74-C-0555)
(AD-A140418; AD-E950517; TR-34-ONR; TR-83-26) Avail: NTIS HC A04/MF A01 CSCL 12/1

The general approach to sequential decision-theoretic problems where sums of successive observations are approximated by a continuous time Weiner process has a number of fundamental advantages. Simple numerical techniques which can be employed to obtain explicit descriptions of the solutions of the resulting continuous time optimal stopping problems are described. The techniques are not well adapted for very precise results, but are surprisingly effective for reasonably accurate approximations. Special features of particular problems can be exploited to reduce the necessary computational effort. The techniques are illustrated in a number of problems thereby clearly indicating their properties. Author (GRA)

N84-26370# Naval Postgraduate School, Monterey, Calif.
LOW-LEVEL STRATUS PREDICTION USING BINARY STATISTICAL REGRESSION: A REPORT USING MOFFETT FIELD DATA Progress Report
D. P. Gaver and P. A. Jacobs Dec. 1983 91 p
(RR01405)
(AD-A140468; NPS55-83-034) Avail: NTIS HC A05/MF A01 CSCL 12/1

Various statistical models and techniques were employed to forecast the existence of low-level stratus conditions. They are illustrated for data at a single station (Moffett Field, Sunnyvale, California) using single-station surface meteorological measurements only as explanatory variables. A preliminary exploratory data analysis shows that low (right) dew point depression is associated with the existence (non-existence) of low-level stratus at Moffett Field. Procedures for and results of various methods of fitting logistic models to the data are described. The fitted models were used to forecast stratus on reserved data sets (cross-validation). Results of the cross-validation are given. Author (GRA)

N84-26075 Karlsruhe Univ. (West Germany). Inst. of Geodetics.
PROBLEMS OF COMPUTING COSTS IN DECISION PROBLEMS
J. vanMierlo *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 71-78 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

N84-26076 Stuttgart Univ. (West Germany). Inst. for Photogrammetry.
RELIABILITY AND DISCERNABILITY OF EXTENDED GAUSS-MARKOV MODELS
W. Foerstner *In* Deut. Geodact. Komm. Seminar on Math. Models of Geodetic Photogrammetric Point Determination with Regard to Outliers and Systematic Errors 1983 p 79-104 refs (For primary document see N84-26069 16-43)
Avail: Issuing Activity

N84-26265# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
PRINCIPAL COMPONENTS AS A METHOD FOR ATMOSPHERICALLY CORRECTING COASTAL ZONE COLOR SCANNER DATA
R. J. Holyer *In its* PAME Proc., Pattern Anal. in the Marine Environ., An Ocean and Technol. Workshop Oct. 1983 p 199-223 (For primary document see N84-26257 16-48)
(AD-P003124) Avail: NTIS HC A13/MF A01 CSCL 12/1

N84-26266# Naval Oceanographic Office, Bay St. Louis, Miss.
WATER MASS CLASSIFICATION IN THE NORTH ATLANTIC USING IR DIGITAL DATA AND BAYESIAN DECISION THEORY
R. E. Coulter *In* Naval Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 225-236 (For primary document see N84-26257 16-48)
(AD-P003125) Avail: NTIS HC A13/MF A01 CSCL 12/1

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N84-26371 Northwestern Univ., Evanston, Ill.
BOUNDS ON NETWORK RELIABILITY Ph.D. Thesis
Yael J. Assous 1983 182 p
Avail: Univ. Microfilms Order No. DA8403389

Past methods to compute the reliability of a network have been based on the assumption that the components of the network fail independently of each other. The present approach discards the assumption of independence, which is often unrealistic, and seeks best lower and upper bounds for various reliability measures on a network when bounds on the failure probabilities of the network components are known. A general framework for reliability analysis is developed in terms of blocking systems. It is shown that polynomial algorithms exist in some cases. Tightening of the bounds is achievod by introducing into the model bounds on the probabilities that pairs of network components fail. A heuristic algorithm is developed to determine the tighter bounds on the probability that two distinguished vertices communicate in a graph. Computational results are presented on this extended model.
Dissert. Abstr.

N84-26372 Northwestern Univ., Evanston, Ill.
FAILURE TIMES AND OPTIMAL STOPPING RULES OF GENERALIZED SHOCK MODELS Ph.D. Thesis
James Walter Drosen 1983 76 p
Avail: Univ. Microfilms Order No. DA84303408

There are many examples of a device suffering damage from random environmental shocks. Airplane parts suffer vibrational damage from turbulence, buildings suffer Earth tremors, earthquakes, and winds of varying intensity. In this dissertation the damage level of such a device over time as a Markov process is modeled. This process is characterized by a stochastic integral equation driven by a Poisson random measure. A solution to this stochastic integral equation is constructed in a nonstandard way. The generators of the process are studied, along with time and state space changes. The time until failure of the device is also considered. It is assumed that there exists some random threshold which, when exceeded by the damage level, causes the device to fail. Questions involving the failure rate of the time until failure are considered. This work is a generalizaton of a seminal paper by Esary, Marshall and Proschan and later work by Abdel-Hameed.
Dissert. Abstr.

N84-26373*# Systems and Applied Sciences Corp., Hampton, Va.
ADVANCED LASER STRATOSPHERIC MONITORING SYSTEMS ANALYSES Final Report
Jack C. Larsen 29 Jun. 1984 74 p refs
(Contract NAS1-15806)
(NASA-CR-172348; NAS 1.26:172348) Avail: NTIS HC A04/MF A01 CSCL 12B

This report describes the software support supplied by Systems and Applied Sciences Corporation for the study of Advanced Laser Stratospheric Monitoring Systems Analyses under contract No. NAS1-15806. This report discusses improvements to the Langley spectroscopic data base, development of LHS instrument control software and data analyses and validation software. The effect of diurnal variations on the retrieved concentrations of NO, NO2 and C L O from a space and balloon borne measurement platform are discussed along with the selection of optimum IF channels for sensing stratospheric species from space.
Author

N84-26374# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.
SINGLE-PILOT IFR FLIGHTS AND OPERATIONS
P. Loranchet 1983 6 p Presented at the AAAF 9th European Rotorcraft and Powered Lift Aircraft Forum, Stresa, Italy, 13-15 Sep. 1983
(SNIAS-832-210-103) Avail: NTIS HC A02/MF A01

The operational, technical, and human features specific to the single pilot Instrument Flight Rules (IFR) are investigated. Problem solving methods are examined. The results of a pilot questionnaire on single pilot IFR are presented.
M.A.C.

N84-26375# National Bureau of Standards, Washington, D.C. National Engineering Lab.
SURVEY OF SENSITIVITY ANALYSIS METHODOLOGY
R. G. Hendrickson Feb. 1984 89 p refs
(PB84-166701; NBSIR-84-2814) Avail: NTIS HC A05/MF A01 CSCL 12B

This survey on the methodology of sensitivity analysis presents a general statement of the several broad categories of this discipline for the purpose of pulling together the various approaches and theory, to show the extent and sophistication of new techniques, special applications, and the relation of sensitivity analysis to model evaluation.
GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N84-26376# Surrey Univ., Guildford (England).
MATHEMATICAL MODELING OF A CONTINUUM. RELATED MODAL ANALYSIS. VOLUME 1: PROBLEM ANALYSIS
M. Davies Paris ESA Nov. 1983 122 p refs 3 Vol.
(Contract ESTEC-4156/79/NL-PP(SC))
(ESA-CR(P)-1862-Vol-1) Avail: NTIS HC A06/MF A01

Volume 1 presents the mathematical analysis of the methods forming the basis of the modal analysis software package written for ESTEC under the therms of the contract. It comprises the methods underlying the computation of modal values, modal vectors and gains matrices in respect of reduced impedance matrices of hermitian form on the real frequency axis. After an introductory chapter, details are given of two fundamental algorithms incorporated in the package for finding modal values, viz a globally convergent automatic root finder and the Wittrick-Williams sign-count algorithm. This is followed by details of linear algebra procedures for generating modal vectors and gains matrices. The application of the Wittrick-Williams algorithm to the dynamic analysis of gyroscopic systems and the effect of unstable modes

is also discussed. The volume concludes with comments on the three ESTEC test cases: Space Telescope; ISPM; Space Telescope solar array in torsion. Author

N84-26377# Surrey Univ., Guildford (England).
MATHEMATICAL MODELLING OF A CONTINUUM. RELATED MODAL ANALYSIS. PART 3: PROGRAMMER'S MANUAL
M. Davies Paris ESA Nov. 1983 325 p 3 Vol.
(Contract ESTEC-4156/79/NL-PP(SC))
(ESA-CR(P)-1862-Vol-3) Avail: NTIS HC A14/MF A01

Volume 3 is a programmer's reference manual. It covers the complete program structure of the two MODALR software packages, including cross-referenced namelists of all subroutines and details of common storage areas. Program descriptions for each subroutine are given. The Appendices furnish the program listings in the order of presentation, together with flow charts in those cases which require further elucidation or where the structural details may be required by the programmer. Author

N84-26378# Rome Air Development Center, Griffiss AFB, N.Y.
A VECTOR SPACE APPROACH TO TIME-VARIANT ENERGY SPECTRAL ANALYSIS
J. E. Roach Dec. 1983 251 p
(AF Proj. 4519)
(AD-A140196; RADC-TR-83-270) Avail: NTIS HC A12/MF A01 CSCL 12/1

When analyzing signals, it is natural and useful to think of them in terms of an energy distribution, which is a function of frequency, evolving with time. Although traditionally used for spectral analysis, the Fourier Transform is inadequate for describing a time evolving spectrum. There are approaches, with appropriate theoretical justification, that attempt to describe the time-variant spectrum. An investigation of these approaches indicates serious difficulties of interpretation and implementation. A more practical and successful approach is a piecewise Fourier Transform. This in-house report provides the theoretical justification, lacking in the open literatures, for the piecewise approach. Also included is a useful framework for applying weighting windows to time-frequency energy spectral analysis. Author (GRA)

N84-26379# Surrey Univ., Guildford (England).
MATHEMATICAL MODELLING OF A CONTINUUM. RELATED MODAL ANALYSIS. VOLUME 2: USER'S MANUAL
Paris ESA Nov. 1983 70 p ref 3 Vol.
(Contract ESTEC-4156/79/NL-PP(SC))
(ESA-CR(P)-1862-Vol-2) Avail: NTIS HC A04/MF A01

Volume 2 is a user's guide to MODALR software. It commences with a brief resume of the basic characteristics of the two packages. This is followed by sections covering the operation and presentation of user-application subroutines which the system requires. Also dealt with are input data handling and intermediate data transfers, output information, scaling and details of debugging and diagnostic facilities. Author

N84-25984# Mississippi State Univ., Mississippi State.
THE IMPORTANCE OF DYNAMICALLY-ADAPTIVE GRIDS IN THE NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS
Z. U. A. Warsi and J. F. Thompson *In* Von Karman Inst. for Fluid Dynamics Computational Fluid Dyn., Vol. 1 1984 46 p refs
(For primary document see N84-25980 16-34)
(Grant AF-AFOSR-0185-80)
Avail: NTIS HC A19/MF A01

N84-26307# Karlsruhe Univ. (West Germany). Inst. fuer Angewandte Mathematik.
A DEVICE FOR THE ACCELERATION OF CONVERGENCE OF A MONOTONOUSLY ENCLOSING ITERATION METHOD
H. Cornelius and G. Alefeld *In* Hochschule der Bundeswehr Sem. on Zeroing Meth. nd Appl., Spring Trimester, 1983 Jan. 1984 p 81-93 refs (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

N84-26308# Technische Univ., Clausthal-Zellerfeld (West Germany).
INTERNAL ITERATION METHODS [INTERVALLITERATIONSVERFAHREN]
Rudolf Krawczyk *In* Hochschule der Bundeswehr Sem. on Zeroing Meth. and Appl., Spring Trimester, 1983 Jan. 1984 p 94-155 refs In GERMAN (For primary document see N84-26304 16-59)
Avail: NTIS HC A10/MF A01

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N84-26380# Rochester Univ., N. Y. Dept. of Chemistry.
CONDUCTIVITY IN SEMICONDUCTORS INDUCED BY VIBRATIONAL-TO-ELECTRONIC ENERGY TRANSFER
I. Last, T. F. George, and D. S. Perry Mar. 1984 13 p
(Contract N00014-80-C-0472)
(AD-A140094; UROCHESTER/DC/84/TR-50) Avail: NTIS HC A02/MF A01 CSCL 20/3

A theoretical approach is presented for vibrational-to-electronic energy transfer at a semiconductor surface due to an impinging polar molecule. Results for the HCl + InSb and HCl + PbSe systems under thermal conditions indicate transition probabilities in the range 0.1 to 10%, which can be readily observed by experimental measurements of the semiconductor electrical conductivity. Author (GRA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N84-26381 Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
ESTIMATING THE TRAJECTORY OF A SOUND SOURCE MOVING WITHOUT ACCELERATION USING OBSERVATIONS FROM A SINGLE STATIONARY SENSOR
F. Dommermuth Oct. 1983 67 p refs In GERMAN; ENGLISH
Sponsored by Bundesministeriums der Verteidigung
(Lfd-215; Rept-8-83) Copyright. Avail: Issuing Activity

The sound generated by a target moving without acceleration is exploited to estimate the parameters which determine its trajectory. Methods based on either frequency, angle, or sound level measurements taken at a single stationary sensor were investigated. Author

N84-26382*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NOISE GENERATED BY A PROPELLER IN A WAKE
P. J. W. Block May 1984 65 p refs
(NASA-TM-85794; NAS 1.15:85794) Avail: NTIS HC A04/MF A01 CSCL 20A

Propeller performance and noise were measured on two model scale propellers operating in an anechoic flow environment with and without a wake. Wake thickness of one and three propeller chords were generated by an airfoil which spanned the full diameter of the propeller. Noise measurements were made in the relative near field of the propeller at three streamwise and three azimuthal positions. The data show that as much as 10 dB increase in the OASPL results when a wake is introduced into an operating propeller. Performance data are also presented for completeness. Author

N84-26383*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A THEORETICAL PREDICTION OF THE ACOUSTIC PRESSURE GENERATED BY TURBULENCE-FLAME FRONT INTERACTIONS

Ronald G. Huff 1984 13 p refs Presented at the Winter Ann. Meeting of the Am. Soc. of Mech. Engr., New Orleans, 9-13 Dec. 1984
(NASA-TM-83587; E-1962; NAS 1.15:83587) Avail: NTIS HC A02/MF A01 CSCL 20A

The equations of momentum annd continuity are combined and linearized yielding the one dimensional nonhomogeneous acoustic wave equation. Three terms in the non-homogeneous equation act as acoustic sources and are taken to be forcing functions acting on the homogeneous wave equation. The three source terms are: fluctuating entropy, turbulence gradients, and turbulence-flame interactions. Each source term is discussed. The turbulence-flame interaction source is used as the basis for computing the source acoustic pressure from the Fourier transformed wave equation. Pressure fluctuations created in turbopump gas generators and turbines may act as a forcing function for turbine and propellant tube vibrations in Earth to orbit space propulsion systems and could reduce their life expectancy. A preliminary assessment of the acoustic pressure fluctuations in such systems is presented. Author

N84-26384*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Mechanical Engineering.
A CRITICAL REVIEW OF NOISE PRODUCTION MODELS FOR TURBULENT, GAS-FUELED BURNERS Final Report
J. R. Mahan Jun. 1984 56 p refs
(Contract NAG3-124)
(NASA-CR-3803; NAS 1.26:3803) Avail: NTIS HC A04/MF A01 CSCL 20A

The combustion noise literature for the period between 1952 and early 1984 is critically reviewed. Primary emphasis is placed on past theoretical and semi-empirical attempts to predict or explain observed direct combustion noise characteristics of turbulent, gas-fueled burners; works involving liquid-fueled burners are reviewed only when ideas equally applicable to gas-fueled burners are pesented. The historical development of the most important contemporary direct combustion noise theories is traced, and the theories themselves are compared and criticized. While most theories explain combustion noise production by turbulent flames in terms of randomly distributed acoustic monopoles produced by turbulent mixing of products and reactants, none is able to predict the sound pressure in the acoustic farfield of a practical burner because of the lack of a proven model which relates the combustion noise source strenght at a given frequency to the design and operating parameters of the burner. Recommendations are given for establishing a benchmark-quality data base needed to support the development of such a model. A.R.H.

N84-26385# European Space Agency, Paris (France).
PROPELLER NOISE AT SUBSONIC BLADE TIP SPEEDS, TORQUE AND THRUST FORCE
Roland Stuff Nov. 1983 84 p refs Transl. into ENGLISH of "Propellerlaerm bei unterschallblattspitzenmachzahlen umfangskraft und axialkraft" rept. DFVLR-Mitt-82-17 DFVLR, Goettingen, West Germany, Oct. 1982 Original language document announced as N83-31425
(ESA-TT-821; DFVLR-Mitt-82-17) Avail: NTIS HC A05/MF A01; original German report available from DFVLR, Cologne DM 27,90

A detaild investigation of the generation of sound and noise arising from propeller blade forces was made. Use is made of an acceleration potential in the mathematical treatment. Analytical solutions are obtaind for the sound field of a propeller in yaw with asymmetric disk loading. Author

N84-26386# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CONTRIBUTION TO THE STUDY OF LIGHT AIRCRAFT PROPELLER NOISE Ph.D. Thesis - Univ. de Technologie de Compeigne
Helene Gounet 1982 122 p refs In FRENCH; ENGLISH summary Report will also be announced as ESA-TT-865
(AD-B073101; ONERA-NT-1982-8; ISSN-0078-3781; ESA-TT-865) Avail: NTIS HC A06/MF A01 CSCL 20/1

A propeller noise prediction program was developed; a numerical application was made in order to determine the parameters acting on the tone acoustic level. The emitted noise is essentially caused by the mean load on the blades and the tip rotation Mach number is the major parameter of the acoustic emission. These results were confirmed by flight measurements. An assessment method for the acoustic field emitted by a propeller derived from charts was reviewed in order to determine its ability for the prediction study of light aircraft propeller noise. With a view to predicting the perceived acoustic levels under acoustic certification conditions for light aircraft, ground reflection phenomena of sound waves were studied and incorporated in the computation model. Author

N84-26387# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
COMPUTATION OF NOISE RADIATING FROM A FREE JET PERPENDICULAR TO ITS AXIS VIA LASER ANENOMETRY MEASUREMENTS
Jean Maulard and Georges Elais 1983 53 p refs In FRENCH; ENGLISH summary Report will also be announced as ESA-TT-870
(ONERA-NT-1983-6; ISSN-0078-3781; ESA-TT-870) Avail: NTIS HC A04/MF A01

A model for the acoustic radiation of a cylindrical free jet in a direction perpendicula to its axis of symmetry is presented. This model is based on Lighthill's equation but with a simplified source term. A number of aerodynamic parameters derived from experience are included. They relate in particular to the power spectral densities associated with (a) the fluctuations of the velocity component which is perpendicular to the jet axis and (b) the fluctuations of the squared value of this velocity component. These velocity spectra have been measured by means of laser anemometry and are expressed by an empirical formula which covers all the various results obtained in the effective acoustic field of the jet. The theoretical expression of the radiated acoustic field as derived from the model and including the measured aerodynamic parameters has been computed. This expression does not rely on any empirical coefficient to match the calculated values and the acoustic measurements. For cold as well as hot jets, both sub and supersonic (if the mixing noise only is considered), a good agreement is achieved between theory and experiment not only for the overall acoustic field but also for its power spectra density. Author

N84-26388# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.
TOWARDS A BETTER UNDERSTANDING OF HELICOPTER EXTERNAL NOISE
Alain Damongeot, Fernand dAmbra, and Bernard Masure 1983 15 p refs Presented at the 39th Ann. Am. Helicopter Soc. Forum, St. Louis, 9-11 May 1983
(SNIAS-832-210-113) Avail: NTIS HC A02/MF A01

A survey of all noise sources which contribute to total external noise of an helicopter is first attempted. This survey is carried out in the frame of the flight configurations (flyover, take off, approach) settled by ICAO for noise regulation. Noise sources considered are: rotor rotational noise (thickness noise, airload noise, quadrupolar noise), engine noise, rotor broadband noise. Noise source levels are assessed through (1) narrow band analysis of ground microphone recordings (2) ground measurements of engine noise (3) theoretical means. The rather quiet AS 332 Super-Puma is taken as an exmple and ICAO annoyance noise unit (PNLdB) is used. Sensitivity of radiated noise level to design parameters is dealt with and some recommendations are suggested in order to reduce the overall noise level in flyover and approach. In particular, thickness-tapered, chord-tapered, swept-back blade tips appear as a good means to reduce the noise in these two flight configurations as it derives from flight measurements carried out on four Aerospatiale helicopters. Author

N84-26389# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany). Abt. Elektrizitaet.

PROCESS CONTROLLED MEASURING VALVE ACQUISITION TAKING EXAMPLE BY THE NOISE MEASURING TECHNIQUE [PROZESSGESTEUERTE MESSWERTERFASSUNG AM BEISPIEL RAUSCHMESSTECHNIK]

Norbert Tauscher and Wolfgang Kessel Nov. 1983 43 p refs In GERMAN

(PTB-E-25; ISSN-0341-6674) Avail: NTIS HC A03/MF A01

The calibration of the standards of noise intensity the standard signal of a standard measurement which is registered and averaged over a long period of time is discussed. A Siemens data processor is used for the standard measurements recording. Data are automatically recorded on a microprocessor. It is possible to: (1) register and record the experiment requirements; (2) project measurement data during the experiment on a screen or analog monitor; (3) record graphically the measurement data after termination of the experiment. Transl. by E.A.K.

N84-26390# Stanford Univ., Calif. Dept. of Mathematics.

REFLECTION, SCATTERING, AND ABSORPTION OF ACOUSTIC WAVES BY ROUGH SURFACES

J. G. Watson and J. B. Keller Jul. 1983 30 p

(AD-A140523) Avail: NTIS HC A03/MF A01 CSCL 20/1

The first and second moments, i.e., the coherent field and the two-point two-time correlation function, are calculated for the acoustic fields scattered from various rough surfaces. For each surface these yield the reflection, absorption and differential scattering coefficients, as well as an equivalent boundary condition for the coherent field. Renormalized coefficients are constructed to eliminate divergences at grazing incidence. The results are specialized to surfaces which are statistically homogeneous in both space and time, to surfaces which are not moving, to surfaces which are simply or multiply periodic, and to surfaces consisting of randomly placed bosses on a smooth surface. The surfaces considered are slightly rough, moving, soft or hard boundaries, and flat surfaces with random admittances or impedances. The analysis is based on the regular perturbation method or Born approximations. Comparisons with previous results are made.

Author (GRA)

N84-25872# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

ANALYSIS OF THE SOUND FIELD RADIATED BY THE ARIANE LAUNCH VEHICLE DURING LIFT-OFF

S. Candel (Ecole Centrale des Arts et Manufactures) *In its* La Rech. Aerospatiale, Bimonthly Bull., No. 1983-6, 217/Nov.-Dec. Apr. 1984 p 17-33 refs (For primary document see N84-25870 16-31)

Avail: NTIS HC A04/MF A01; HC available at ONERA, Paris FF 55; original report in FRENCH available at ONERA, Paris FF 60

N84-26264# California Univ., San Diego. Inst. of Geophysics and Planetary Physics.

THE IDENTIFICATION AND INVERSION OF ACOUSTIC MULTIPATH DATA AT LONG RANGE IN THE OCEAN

M. G. Brown *In* Naval. Ocean Res. and Develop. Activity PAME Proc., Pattern Anal. in the Marine Environ., An Ocean Sci. and Technol. Workshop Oct. 1983 p 189-197 (For primary document see N84-26257 16-48)

(AD-P003123) Avail: NTIS HC A13/MF A01 CSCL 20/1

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-26391# Materials Research Labs., Ascot Vale (Australia). Physics Div.

DEVELOPMENT OF AN X-RAY FACILITY FOR RADIATION DOSIMETRY STUDIES

R. B. Huntley Dec. 1983 59 p refs

(MRL-R-910; AR-003-807) Avail: NTIS HC A04/MF A01

An X ray test facility is described which provides photon beams of sharply defined energy in the range 5 to 250 keV. Methods adopted include the use of composite filters and radiator foils. Characteristics of the radiation beams are established, including their intensities, energy spectra, and transvese uniformities, and a operating chart is presented. The facility is employed for a wide range of radiation experiments, and its application to the testing and calibration of civilian, military, and civil defence radiation measuring instruments is considered in detail. Author

N84-26392# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.

ENVIRONMENT-INDEPENDENT HOMOGENIZED PARAMETERS FOR NEUTRON DIFFUSION IN NON-SYMMETRIC SLABS

G. C. Pierini 1983 22 p refs Presented at the Intern. Conf. on Numerical Methods in Nucl. Eng., Montreal, 6-9 Sep. 1983

(CISE-2117) Avail: NTIS HC A02/MF A01

Properly defined group diffusion parameters are needed in order to describe accurately the neutronic behavior of reactor cores by means of equivalent homogeneous regions, or nodes. First, important characteristics of the reactor, such as the effective multiplication factor and nodal reaction rates, are to be preserved. Then, as neutron flux and current are continuous functions of the position, a basic requirement should be that fluxes and currents have the same boundary values for the actual node and its equivalent homogeneous counterpart. Here a method is presented which, by assuming linear anisotropy for the homogenized medium, is able to determine environment independent homogenized parameters for neutron diffusion in nonsymmetric slabs. Some test problems are presented and the appropriate extension of the method to multidimensional geometries is briefly discussed. Author

N84-26393# European Space Research and Technology Center, Noordwijk (Netherlands). Products Assurance Div.

THE PARTICLE AND ULTRAVIOLET (UV) RADIATION TESTING OF SPACE MATERIALS

Mar. 1983 36 p refs

(ESA-PSS-01-706-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

Particle and UV radiation testing of materials proposod for use in ESA spacecraft are defined and, in particular, those used for external surface that are not shielded from space radiation.

Author

N84-26394# Naval Research Lab., Washington, D. C.

REB (RELATIVISTIC ELECTRON BEAM)/CHANNEL TRACKING EXPERIMENTS IN LOW PRESSURE AMMONIA

D. P. Murphy, M. Raleigh, E. Laikin, R. E. Pechacek, and J. R. Greig 26 Mar. 1984 33 p

(ARPA Order 4395; RR01109; OR40AA)

(AD-A140209; NRL-MR-5281) Avail: NTIS HC A03/MF A01 CSCL 20/7

This document presents the results of an investigation of the interaction between an intense relativistic electron beam (REB) and reduced density channels in ammonia (NH3) at 40 Torr. The channels were produced by absorption in the ammonia of energy from a pulsed CO2 laser. Two channel geometries were studied. The first employed an 2.5 cm radius channel with the nominally 1.2 cm radius REB injected coaxially. The second geometry employed an annular channel with its minimum density at 2.3 cm radius and near ambient density on axis. The REB was again injected coaxially. It was found that the conductivity induced in the reduced density channel by the REB caused large plasma currents to flow in the channel. The REB current and the plasma current flowed in opposite directions during most of the REB pulse, causing the REB to be expelled/repelled from the channel.

Author (GRA)

N84-26395# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Chemical Systems Lab.

MOBILITY AND MOLECULAR IONS OF DIMETHYL METHYL PHOSPHONATE, METHYL SALICYLATE AND ACETONE Technical Report, Jan. - May 1983

D. M. Nowak Jun. 1983 40 p

(DA Proj. 1L1-62706-A-553)
(AD-A140328; ARCSL-TR-83056) Avail: NTIS HC A03/MF A01 CSCL 07/3

The mobilities of positive and negative reactant ions are reported for (H2O)nH(+); (H2O)2O2 and (H2O)2CO3(-) ion clusters. The formation of positive DMMP monomer and dimer is reported, and equilbria molecular reactions are reported. Acetone is reported as forming a dimer at 81 ppb with a reduced mobility (K sub o) of 1.82, Methyl salicylate is shown to form a protonated and hydrated positive monomer. Mixtures of DMMP and methyl salicylate with acetone showed a substantial change in DMMP ion clustering and little or no change in the methyl salicylate mobility spectra. Negative ions were not observed for DMMP, methyl salicylate, acetone and the mixtures under the conditions reported. GRA

N84-26396# McDonnell-Douglas Research Labs., St. Louis, Mo.
INVESTIGATION OF SHORT-PULSE ELECTRON-BEAM PROPAGATION Final Technical Report, 7 May 1982 - 7 Dec. 1983
M. A. Greenspan and E. A. Rose 7 Dec. 1983 49 p
(Contract N60921-82-C-0091; ARPA Order 4395)
(AD-A140383; MDC-Q1208) Avail: NTIS HC A03/MF A01 CSCL 20/7

Experiments were performed studying the propagation of a 1-MeV, 2-8 kA, 10-ns electron beam, and possible comparisons of this data with theory are recommended. Radial boundary conditions were varied by performing experiments in a glass guide tube 7.6 cm in diameter, the same tube with a conducting screen inside, and a 3.4-m-diam vacuum chamber. GRA

N84-26397# Hawaii Univ., Honolulu. Dept. of Physics and Astronomy.
DEVELOPMENT AND APPLICATION OF LOW ENERGY X-RAY AND ELECTRON PHYSICS Final Report, 1 Oct. 1978 - 30 Sep. 1983
B. L. Henke 14 Mar. 1984 91 p
(Grant AF-AFOSR-0027-79; AF Proj. 2301)
(AD-A140480; AFOSR-84-0252TR) Avail: NTIS HC A05/MF A01 CSCL 20/8

The objectives and results of this on-going AFOSR program in low-energy X-ray physics are reviewed for the five-year period, 1978-1983. Its thirty major research publications for this period are abstracted. The following applications of this research are discussed: measurement, compilation and calculation of low-energy X-ray optics; high temperature plasma diagnostics. The role of this program in the training of students for X-ray physics and in participating in collaborative research efforts with other laboratories is described. Author (GRA)

N84-26189*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHARGED PARTICLE EFFECTS ON SPACE SYSTEMS
W. N. Hall and N. J. Stevens *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 79-106 refs Prepared in cooperation with AFGL, Hanscom AFB, Mass. (For primary document see N84-26185 16-46)
(AD-P002103) Avail: NTIS HC A18/MF A01 CSCL 20H

N84-26192*# Stanford Univ., Calif. Space, Telecommunications, and Radioscience Lab.
ELECTRON BEAM EXPERIMENTS AND OTHER OBSERVATIONS FROM STS-3
P. M. Banks *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 125-131 ref (For primary document see N84-26185 16-46)
(Contract NAS5-24455)
(AD-P002106) Avail: NTIS HC A18/MF A01 CSCL 20H

N84-26193*# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
FLOATING POTENTIALS AND THE HOT PLASMA GENERATED BY AN ELECTRON-BEAM-EMITTING ROCKET IN THE IONOSPHERE
J. R. Winckler *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 133-140 refs (For primary document see N84-26185 16-46)
(Grant NsG-5088)
(AD-P002107) Avail: NTIS HC A18/MF A01 CSCL 20H

N84-26195# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
ESTIMATES OF PRECIPITATING ELECTRON POWER FLUX FROM SIMULTANEOUS DMSP AURORAL IMAGE AND ISEE-1 AKR OBSERVATIONS
N. A. Saflekos and R. E. Sheehan *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 157-162 ref (For primary document see N84-26185 16-46)
(AD-P002109) Avail: NTIS HC A18/MF A01 CSCL 20/8

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N84-26398*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A STOCHASTIC MODEL FOR PHOTON NOISE INDUCED BY CHARGED PARTICLES IN MULTIPLIER PHOTOTUBES OF THE SPACE TELESCOPE FINE GUIDANCE SENSORS
Leonard W. Howell and Hans F. Kennel Jun. 1984 67 p refs (NASA-TP-2337; NAS 1.60:2337) Avail: NTIS HC A04/MF A01 CSCL 03A

The Space Telescope (ST) is subjected to charged particle strikes in its space environment. ST's onboard fine guidance sensors utilize multiplier phototubes (PMT) for attitude determination. These tubes, when subjected to charged particle strikes, generate spurious photons in the form of Cerenkov radiation and fluorescence which give rise to unwanted disturbances in the pointing of the telescope. A stochastic model for the number of these spurious photons which strike the photocathode of the multiplier phototube which in turn produce the unwanted photon noise are presented. The model is applicable to both galactic cosmic rays and charged particles trapped in the Earth's radiation belts. The model which was programmed allows for easy adaption to a wide range of particles and different parameters for the phototube of the multiplier. The probability density functions for photons noise caused by protons, alpha particles, and carbon nuclei were using thousands of simulated strikes. These distributions are used as part of an overall ST dynamics simulation. The sensitivity of the density function to changes in the window parameters was also investigated. Author

N84-26399# Naval Research Lab., Washington, D. C.
OBSERVATION OF RAYLEIGH-TAYLOR-LIKE STRUCTURES IN A LASER-ACCELERATED FOIL
R. R. Whitlock, M. H. Emery, J. A. Stamper, E. A. McLean, and S. P. Obenschain 19 Mar. 1984 10 p
(AD-A140294; NRL-MR-5204) Avail: NTIS HC A02/MF A01 CSCL 17/8

Laser-accelerated targets have been predicted to be subject to the Rayleigh-Taylor hydrodynamic instability. The development of the instability was studied by introducing mass thickness variations in foil targets and observing the development of the target nonuniformities by side-on flash x radiography. Observations were made of target structures and mass redistribution effects which resemble Rayleigh-Taylor bubbles and spikes, including not only advanced broadening of the spike tips on the laser-irradiated side of the foil, but also projections of mass on the unirradiated

side. The observations compare well with numerical simulations.
Author (GRA)

74 OPTICS

Includes light phenomena.

N84-26400*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OPTICAL SYSTEM WITH REFLECTIVE BAFFLES Patent Application
William I. Linlor, inventor (to NASA) Filed 28 Mar. 1984 17 p
(NASA-Case-ARC-11502-1; US-Patent-Appl-SN-594134) Avail: NTIS HC A02/MF A01 CSCL 20F

Reflective baffles for optical systems have elliptical concave surfaces facing forward of the system to reflex off axis radiation directly out of the telescope only. Such reflective baffles intrude substantially into the field of vision of the optical system and are effective only for reflecting meridional off axis rays. The baffles of this invention reduce the field of vision only slightly and are effective both for meridional and skew off axis rays. NASA

N84-26401# Bayer A.G., Leverkusen (West Germany).
DYES FOR DISPLAYS Final Report, Aug 1982
Uwe Claussen Bonn Bundesministerium fuer Forschung und Technologie. Jan. 1984 30 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-100; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 6,50

The improvement of contrast and visibility of LCD by two different means was undertaken. The two methods are: (1) development of fluorescent dyes to increase the visibility of fluorescent activated displays (FLAD); and (2) development of dichroic dyes to increase the contrast of displays. This work was done in close cooperation with the electronic industry, where the newly synthesized dyes were tested. The targets for the chemical synthesis were selected with the help of computer model calculations. A marketable range of dyes was developed. Since the interest of the electronic industries concerning FLAD was low, the investigations were stopped. Dichroic dyes, especially black mixtures with good light fastness, order parameter, and solubility in nematic phases were developed. The application of these dyes is restricted to indoor use because of an increase of viscosity below -10 C. Applications on a technical scale, e.g., for the automotive industry, will be possible if the displays work at temperatures down to -40 C. This problem requires a complex optimization of the dye/nematic phase system. Author

N84-26402# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
UTILIZATION OF LIGHT WAVE SCALES AND OPTO-ELECTRONIC TRANSFORMERS FOR MEASURING DISTORTION AND EXPANSION Final Report [DIE ANWENDUNDUNG VON LICHTWELLENLEITERN UND OPTOELEKTRONISCHEN WANDLERN BEI VERFORMUNGS- UND DEHNUNGSMESSUNGEN]
J. H. Argyris, W. Aicher, K. Eberle, and M. Kirschstein May 1983 23 p refs In GERMAN
(Contract DFG-AR-44/49)
(ISD-309; ISSN-0170-6071) Avail: NTIS HC A02/MF A01

A procedure to measure an online three and two dimensional distortion is described. Computer controlled cameras with electro-optic detectors for active radiation measuring prints of light wave scales, which are linked at the other end to infrared LED's serve as measuring instruments. Transl. by E.A.K.

N84-26403# European Space Agency, Paris (France).
FOUNDATIONS OF A NUMERICAL MODEL OF SLANT VISIBILITY
Gerhard H. Ruppersberg Apr. 1984 138 p refs Transl. into ENGLISH of "Grundlagen fuer ein numerisches modell der schraegsichtweite" rept. DFVLR-FB-82-01 DFVLR, Oberpfaffenhofen, West Germany, Oct. 1981 Original language document announced as N82-24073
(ESA-TT-757; DFVLR-FB-82-01) Avail: NTIS HC A07/MF A01; original German report available from DFVLR, Cologne DM 33,60

The slant visibility of objects seen against a background different from sky at the horizon is treated. The complex interaction between the numerous parameters of observation and environment is numerically interpreted. The computer programming is explained. A specific interpolation procedure was developed, using experimental experience, which essentially reduces computer time. It was applied to a selection of modelling parameters which led to a contrast transmittance model. Author

N84-26404# Naval Research Lab., Washington, D. C.
ESTIMATING SPECTRAL INDICES FROM TRANSFORMS OF DISCRETE REPRESENTATIONS OF DENSITY FUNCTIONS
M. Mulbrandon, N. J. Zabusky, and E. Hyman 30 Mar. 1984 42 p
(AD-A140164; NRL-MR-5298) Avail: NTIS HC A03/MF A01 CSCL 17/8

Structuring of plasma in the high altitude disturbed atmosphere can adversely impact the operation of optical detectors this paper considers idealized functions of one variable that may represent scan functions that are obtained from three-dimensional optical sources observed by remote sensors. The authors establish the relationship between singular properties of these functions or their derivatives and the spectral index of their transforms, and describe the limitations on obtaining reliable spectral indices where there is no clear separation of scales in a spatial profile. The ability to extract a good estimate of the spectral index depends on the complexity of the spatial emission profile, the adequacy of resolution, and aliasing errors that necessarily result from the analysis. They illustrate these competitive effects by numerical examples using spatial profiles of a top hat, circular arc and trapezoid. Author (GRA)

N84-26405# Utah Univ., Salt Lake City.
STUDIES ON LIGHT SCATTERING AND ABSORPTION PROPERTIES OF ICE CLOUDS FOR VISIBLE AND INFRARED LASER WAVELENGTHS Final Report, 1 Jun. 1979 - 31 Dec. 1982
K. N. Liou 8 Aug. 1983 39 p
(Contract F49620-79-C-0198; AF Proj. 2310)
(AD-A140528; AFOSR-84-0129TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

This letter report summarizes the results of experimental evaluations of angular scattering and absorption by ice particles of CO2 laser radiation at 10.6 micrometers wavelength. Experimental results are presented which summarize particle effects such as spontaneous fragmentation and changes in the growth habit. These are compared to model predictions to determine effects upon the backscattered radiation, and polarization. A scattering model is presented which involves complete polarization information for arbitrarily oriented hexagonal columns and plates. It is discussed that a computational technique was developed for randomly oriented hexagonal cylinders and spheroids which show general agreement for phase functions of these geometric sizes and shapes except for the twenty-two and forty-six degree halo features and the backscattering maximum. An attachment to the letter report presents graphed and tabulated data for phase matrix elements for laser wavelengths of .55, .6328, .7, 1.3, 3.8 and 10.6 micrometers based on model calculations. Author (GRA)

N84-25975# Stanford Univ., Calif.
OPTICAL PROCESSING
L. Hesselink *In* Von Karman Inst. for Fluid Dyn. Digital Image Processing in Fluid Dyn. 1984 110 p refs (For primary document see N84-25973 16-34)
Avail: NTIS HC A19/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N84-26406 Institut d'Aeronomie Spatiale de Belgique, Brussels.
BOUNDARY LAYERS IN SPACE PLASMAS: A KINETIC MODEL OF TANGENTIAL DISCONTINUITIES
M. Roth 1984 38 p refs Presented at 16th Intern. Conf. on Phenomena in Ionized Gases, Duesseldorf, 29 Aug. 1983 Submitted for publication
(Aeronomica-Acta-A-280-1984) Avail: Issuing Activity

A kinetic model for tangential discontinuity in a collisionless magnetized plasma with multiple particle species reviewed. A one-dimensional and stationary model whose boundary conditions on each side of the current sheet are specified by unlike densities, temperatures and average velocities for each plasma component is presented. These average velocities must however be compatible with the asymptotic conditions of plasma uniformity. The model also allows the magnetic field to make an arbitrary rotation in the plane of the discontinuity. Vlasov equations for the particle species and Maxwell's equations for the fields are solved simultaneously. The theory is self-consistent in that the electric potential and the electric field are obtained from the charge-neutral approximation which is verified in most cases. The electric field inside the current sheet is far from being identical with the convection electric field which is assumed to be a good approximation for the actual electric field in the MHD framework. Author

N84-26407# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RESISTIVITY OF A 2-D ELECTRON GAS UNDER STRONG MAGNETIC FIELD USING A MEMORY FUNCTION FORMULATION
Ivan Costa daCunhaLima and S. C. Ying (Brown Univ., Providence, R.I.) May 1984 22 p refs Submitted for publication
(INPE-3118-PRE/513) Avail: NTIS HC A02/MF A01

A memory function projection operator technique is used to obtain the resistivity of a two dimensional electron gas under a strong magnetic field. In the dilute limit of impurities the resistivity is expressed in terms of an averaged force-force correlation function. Author

N84-26408# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RESISTIVITY OF A DISORDERED 2-D ELECTRON GAS IN TERMS OF FORCE-FORCE CORRELATION FUNCTION
Ivan Costa daCunhaLima Apr. 1984 6 p refs Presented at the Simposio Latino-Am. de Fis. dos Sistemas Amorfos, Niteroi (Brazil), Feb. 1984
(INPE-3065-PRE/482) Avail: NTIS HC A02/MF A01

The lowest order diagram in a perturbative expansion of the force-force correlation function for a 2-D electron gas under strong magnetic field is used to calculate its resistivity. Author

N84-26409*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PARTICLE ACCELERATION BY TURBULENT MAGNETOHYDRO-DYNAMIC RECONNECTION
W. H. Matthaeus, J. J. Ambrosiano, and M. L. Goldstein Jun. 1984 16 p refs
(NASA-TM-86121; NAS 1.15:86121) Avail: NTIS HC A02/MF A01 CSCL 20I

Test particles in a two dimensional, turbulent MHD simulation are found to undergo significant acceleration. The magnetic field configuration is a periodic sheet pinch which undergoes reconnection. The test particles are trapped in the reconnection region for times of order an Alfven transit time in the large electric fields that characterize the turbulent reconnection process at the relatively large magnetic Reynolds number used in the simulation. The maximum speed attained by these particles is consistent with an analytic estimate which depends on the reconnection electric field, the Alfven speed, and the ratio of Larmor period to the Alfven transit time. Author

N84-26410# Paris-Sud Univ., Orsay (France). Lab. de Physique des Gaz et des Plasmas.
MICROWAVE DISCHARGES IN CAPILLARY TUBES [DECHARGES MICROONDES DANS DES TUBES CAPILLAIRES]
E. Dervisevic, E. Bloyet, C. Laporte, and S. Saada Feb. 1984 120 p refs In FRENCH
(LP-203) Avail: NTIS HC A06/MF A01

Discharges of argon in a capillary tube with a diameter less than 6mm were studied and the discharges were macroscopically described while taking into account results already obtained for tubes with larger diameters. Fundamental equations describing the discharge are given and surface wave propagation, both radial and longitudinal, is examined. The creation of plasma; optical and electrical measuring techniques; data processing; interpretation of results; and influence of certain parameters are discussed. Components of the electromagnetic field of the wave are also considered. Transl. by A.R.H.

N84-26411# Paris-Sud Univ., Orsay (France). Lab. de Physique des Gaz et des Plasmas.
ROLE OF EXCITATION FREQUENCY IN DISCHARGES CREATED BY SURFACE WAVES [ROLE DE LA FREQUENCE D'EXCITATION DANS LES DECHARGES CREES PAR ONDES DE SURFACE]
Caroline Boisse-Laporte, E. Bloyet, E. Dervisevic, A. Laye-Granier, P. Leprince, J. Marec, Z. Rakem, and S. Saada Mar. 1984 150 p refs In FRENCH
(LP-205) Avail: NTIS HC A07/MF A01

Plasma columns produced by surface waves present an electron density gradient from excitation at the end of the discharge. Discharges of argon were created by surface waves under low pressure at 210 MHz and 2450 MHz. The electron densities and ionization efficiencies obtained were compared and the independent characteristics of the wave frequency were isolated. Whether the laws found at 2450 MHz (similitude law and spontaneous plasma emission) are valid at 210 MHz was investigated as well as the dependence of these laws on frequency.
Transl. by A.R.H.

N84-26412# Princeton Univ., N. J. Plasma Physics Lab.
ENERGETIC ION BEAM-PLASMA INTERACTIONS Final Report, 15 Jun. 1983 - 15 Jan. 1984
R. Kulsrud 9 Mar. 1984 7 p
(Grant AF-AFOSR-0203-83; AF Proj. 2301)
(AD-A140173; AFOSR-84-0228TR) Avail: NTIS HC A02/MF A01 CSCL 20/9

This final report covers work carried out under a Air Force Office of Scientific Research Grant during the period June 15, 1983 to January 15, 1984. During this concluding period we completed the investigation of the amount of neutralization of the energetic ion beam and carried out preliminary investigations of possible instabilities and of the rate at which the beam might expand under various conditions. GRA

N84-26413*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
PRODUCTION OF PLASMA WITH VARIABLE, RADIAL ELECTRIC FIELDS Progress Report
B. Kustom, R. L. Merlino, and N. DAngelo Feb. 1984 12 p
(Grant NGL-16-001-043; Contract N00014-83-K-0452)
(NASA-CR-173434; NAS 1.26:173434; AD-A140229;
U-OF-IOWA-84-3) Avail: NTIS HC A02/MF A01 CSCL 20I

A device is described suitable for plasma wave experiments requiring relatively large, variable, radial electric fields perpendicular to a static magnetic field. By separately adjusting the potentials of two independent, coaxial discharge plasmas, the authors produced plasmas with a radial electric field E sub r < approximately 5 V/cm. Author (GRA)

N84-26414# Stanford Univ., Calif. High Temperature Gasdynamics Lab.
FUNDAMENTAL PROCESSES IN PARTIALLY IONIZED PLASMAS Annual Scientific Report, 1 Feb. 1983 - 31 Jan. 1984
C. H. Kruger, M. Mitchner, and S. A. Self Feb. 1984 33 p
(Grant AF-AFOSR-0108-83; AF Proj. 2301)
(AD-A140549; AFOSR-84-0257TR) Avail: NTIS HC A03/MF A01 CSCL 20/9

This report describes progress during the first year of a research program on the Fundamental Processes in Partially Ionized Plasmas conducted in the High Temperature Gasdynamics Laboratory at Stanford University. This research is directed to three major areas: recombination in molecular plasmas, discharge effects (plasma electrode interaction) and interaction of discharges and fluid dynamics. Recombination and ionization are fundamental processes that play a role in nearly all applications and natural phenomena that involve partially ionized plasmas. Under the present program, experiments have been designed and theoretical analyses conducted to obtain a better knowledge of the rates of electron recombination in the presence of molecular species. Studies have been initiated of the near-electrode region and the processes by which current is transferred between the plasmas and the electrodes. The first stage of theoretical modeling of the processes has now been completed and published. A study of the interaction of discharges and fluid dynamics has measured the significant secondary flows caused by the interaction of a magnetic field with a current-carrying plasma. Experimental and theoretical research in each of these areas is continuing. GRA

N84-26415# Los Alamos Scientific Lab., N. Mex.
INTERACTION OF THE NEUTRAL DEUTERIUM FLUX WITH A FIELD-REVERSED CONFIGURATION
Donald J. Rej 1984 5 p refs Presented at the 6th US-Japan Symp. on Compact Toroid Res., Princeton, N. J., 20 Feb. 1984
(Contract W-7405-eng-36)
(DE84-007488; LA-UR-84-601; CONF-840255-1) Avail: NTIS HC A02/MF A01

Recycling effects arising from the penetration of cold neutrals into a hot plasma were known to contribute to confinement properties of Tokamaks, mirrors, RFPs, and spheromaks. To data, however, ionization and charge exchange processes associated with the possible influx of neutrals were neglected in FRC transport models, or their effects were found negligible for experiments with short lifetimes (< 20 (MU)s). These processes are also neglected when ascertaining the experimental particle confinement time tau/sub N/. As experimental FRC lifetimes were recently extended to record values (greater than or equal to 300 (MU)s), these effects on transport may no longer be negligible. Furthermore, these losses are enhanced when FRCs translate at axial speeds much greater than the thermal speeds of the neutrals. DOE

N84-26191*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
STS-3/OSS-1 PLASMA DIAGNOSTICS PACKAGE (PDP) MEASUREMENTS OF ORBITER-GENERATED V X B POTENTIALS AND ELECTROSTATIC NOISE
S. D. Shawhan and G. B. Murphy *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 119-123 (For primary document see N84-26185 16-46)
(Contract NAS8-32807)
(AD-P002105) Avail: NTIS HC A18/MF A01 CSCL 20I

N84-26205# Science Applications, Inc., La Jolla, Calif.
THE IMPORTANCE OF NEUTRALS, TRANSIENT EFFECTS, AND THE EARTH'S MAGNETIC FIELD ON SHEATH STRUCTURE
L. M. Linson *In* AFGL Proc. of the AFGL Workshop on Nat. Charging of Large Space Struct. in Near Earth Polar Orbit 25 Jan. 1983 p 283-292 refs (For primary document see N84-26185 16-46)
(AD-P002119) Avail: NTIS HC A18/MF A01 CSCL 20/9

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-26416# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
IMPURITY STATES IN 2- AND 3-DIMENSIONAL DISORDERED SYSTEMS
Antonio Ferreira daSilva and Mauricio Fabbri Apr. 1984 12 p refs Presented at the Simposio Latino-Am. de Fisica dos Sistemas Amorfos, Niteroi, Brazil, Feb. 1984 Submitted for publication
(INPE-3066-PRE/483) Avail: NTIS HC A02/MF A01

The microscopic structure of the impurity states in two and three dimensional (2D and 3D) disordered systems was investigated. A cluster model is outlined for the donor impurity density of states (DIDS) of doped semiconductors. The impurity states are very sensitive to a change in the dimensionality of the system, i.e., from 3D to 2D system. All eigenstates become localized in 2D disordered system for a large range of concentration. Author

N84-26417# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE 2-D IMPURITY STATES ASSOCIATED WITH INVERSION LAYERS
I. C. daCunha Lima, P. S. Guimaraes, A. Ferreira daSilva, and J. R. S. Senna Apr. 1984 9 p refs Presented at the Simposio Latino-Am. de Fisica dos Sistemas Amorfos, Niteroi, Brazil, Feb. 1984 Submitted for publication
(INPE-3081-PRE/493) Avail: NTIS HC A02/MF A01

The density of states for electrons at the inversion layer of an MOS structure due to Na(+) impurities located in the oxide was obtained. The impurity potential is assumed unscreened. The disorder was taken into account to obtain the configurational averaged Green's function starting from a tight binding Hamiltonian. Author

N84-26418# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MEMORY FUNCTION FORMALISM APPLIED TO ELECTRONIC TRANSPORT IN DISORDERED SYSTEMS
Ivan Costa daCunhaLima Apr. 1984 14 p refs Presented at the Simposio Latino-Am. de Fis. dos Sistemas Amorfos, Niteroi (Brazil), Feb. 1984
(INPE-3064-PRE/481) Avail: NTIS HC A02/MF A01

Memory function formalism is briefly reviewed and applied to electronic transport using the projection operator technique. The resistivity of a disordered 2-D electron gas under strong magnetic field is obtained in terms of the force-force correlation function. Author

N84-26419# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A CALCULATION OF THE PRESSURE DEPENDENT ENERGY BANDS OF COOPER CHLORIDE
Paulo Sergio Guimaraes May 1984 13 p refs Submitted for publication
(INPE-3094-PRE/498) Avail: NTIS HC A02/MF A01

Small clusters of atoms are used to obtain the pressure dependent energy bands of copper chloride within the framework of the crystalline cluster method. The results obtained reproduce the bether band structure calculations within the accuracy of the muffin-tin and X (sub alpha) approximations. Author

N84-26420# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A CLUSTER MODEL FOR THE DETERMINATION OF THE STATE OF IMPURITIES IN CRYSTAL [UM MODELO DE AGREGADO PARA A DETERMINACAO DE ESTADOS DE IMPUREZAS EM CRISTAIS]
Paulo S. Guimaraes Mar. 1984 9 p refs In PORTUGUESE; ENGLISH summary Presented at a Simp. Latino Am. de Fis. dos

Sistemas Amorfos, Niteroi, Brazil, 27 Feb. - 2 Mar. 1984
(INPE-3048-PRE/471) Avail: NTIS HC A02/MF A01

An ab initio self consistent field procedure for the deep impurity electronic structure determination, which is an improvement of the crystalline cluster method proposed for the study of perfect crystals. Since the cluster is chosen in a suitable way, this procedure becomes formally equivalent to the consistent solution of the defect in the Wannier representation, without loosing the handling simplicity inherent to the cluster methods. Such a procedure was successfully used in the determination of the electronic structure of an U center in a NaCl matrix. Author

N84-26421*# National Aeronautics and Space Administration, Washington, D. C.
CRYSTALLIZATION OF THE GLASSY PHASE OF GRAIN BOUNDARIES IN SILICON NITRIDE
D. A. Jefferson, J. M. Thomas, and Shulin Wen (Chinese Academy of Sciences) Apr. 1984 17 p refs Transl. into ENGLISH from Guisuanyan Xuebao (China), v. 10, no. 1, Mar. 1982 p 1-8 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Cambridge Univ., England
(NASA-TM-77466; NAS 1.15:77466) Avail: NTIS HC A02/MF A01 CSCL 09A

Three types of hot-pressed silicon nitride specimens (containing 5wt% Y_2O_3 and 2wt% Al_2O_3 additives) which were subjected to different temperature heat treatments were studied by X-ray diffraction, X-ray microanalysis and high resolution electron microscopy. The results indicated that there were phase changes in the grain boundaries after heat treatment and the glassy phase at the grain boundaries was crystallized by heat treatment. Author

N84-26422# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
STUDY OF LOW TEMPERATURE PLASTIC DEFORMATION MECHANISMS OF ALPHA-TITANIUM SINGLE CRYSTALS Ph.D. Thesis - Paris-Sud Univ.
Shigehisa Naka 1983 121 p refs In FRENCH; ENGLISH summary Report will also be announced as ESA-TT-871
(ONERA-NT-1983-7; ISSN-0078-379X; ESA-TT-871) Avail: NTIS HC A06/MF A01

The importance of the Peierls mechanism in the plastic deformation behavior of titanium is emphasized, as is the case of BCC metals. A non-planar core structure of screw dislocations was proposed; the core is dissociated simultaneously in one prismatic plane (10 bar 10) and two 1st order pyramidal planes (10 bar 11) and (10 bar 1 bar1). The model of the core structure permitted qualitative explanation of various experimental results associated with the movement of screw dislocations (macro yield stress) which needs a recombination of the partials lying out of the slip plane. The hardening effect of inertial impurities was explained by introducing a modification of the core structure by the presence of impurities in the form of clusters (chemical interaction). This modification makes the recombination of the core more difficult. The presence of stage II on the stress vs strain curve at 77 K was explained by the fact that the micro yield stress corresponding to the propagation of edge dislocations was relatively high. That seems to be a particularity of titanium, at least, within the purity range of the titanium used. Author

N84-26423# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.
DEVELOPMENT OF VLSI MEMORIES Final Report, Apr. 1983
Kurt Hoffmann and Dieter Kantz Bonn Bundeministerium fuer Forschung und Technologie Jan. 1984 181 p refs In GERMAN; ENGLISH summary Sponsored by Bundeministerium fuer Forschung und Technologie
(BMFT-FB-T-84-022; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 34,50

Seven MOS memories were developed including technology: two of these memories are high density dynamic RAMS with 64K bit and 256K bit; two optically erasable ROMs with 32K bit and 64K bit; and three electrically erasable ROMs with 512 bit, 1 K bit and 8K bit. The key technologies, which were developed, are the VMOS technique, the double poly silicon gate technique and the floating gate technique. In addition developments are made for improving the plastic package, reliability, testing and tools for analyzing. Author

N84-26424# Case Western Reserve Univ., Cleveland, Ohio.
STRUCTURE OF SILVER (100) AND (111) SINGLE-CRYSTAL SURFACES OBTAINED BY CHEMICAL POLISHING
R. R. Adzic, M. E. Hanson, and E. B. Yeager 1 Dec. 1983 9 p
(Contract N00014-75-C-0953)
(AD-A140148; TR-55) Avail: NTIS HC A02/MF A01 CSCL 09/1

In single-crystal electrochemical studies, various researchers have prepared the electrode surfaces by mechanical polishing followed by chemical polishing without further cleaning or high temperature annealing in vacuo. The quality of such single-crystal surfaces is in question. The present work has involved the use of LEED (Low Energy Electron Diffraction) and Auger electron spectroscopy (AES) to examine the order and purity of the silver (111) and (100) surfaces after preparation with such procedures with the chemical polishing carried out in a cyanide-hydrogen peroxide solution. For both surfaces the LEED patterns have surprisingly well-defined spots indicating a high two-dimensional periodicity, although not as ordered as the UHV cleaned and annealed surfaces. Highly diffuse background and weak fractional-order spots are present in the LEED pattern of the chemically polished surfaces, probably due to random and order impurity adsorption during transfer to the vacuum chamber. The Auger electron spectra before sputtering indicate the main impurity to be carbonaceous with no nitrogen detected. Voltammetry curves in 0.1M HF in a thin-layer cell are generally featureless over the potential range -0.1 to +0.45V vs RHE. These data indicate that chemical polishing can yield silver single-crystal surfaces of sufficient quality to produce LEED patterns but still short of the quality for UHV cleaned and annealed surfaces. Author (GRA)

N84-26425# Strathclyde Univ., Glasgow (Scotland).
THE INFLUENCE OF LATTICE IMPERFECTIONS ON THE CHEMICAL REACTIVITY OF SOLIDS. THE GROWTH AND PERFECTION OF TNT (TRINITRO-TOLUENE) SINGLE CRYSTALS Final Technical Report
J. N. Sherwood and H. G. Gallagher Feb. 1984 37 p
(Contract DAJA37-81-M-0395; Grant DA-ERO-78-G-078; DA Proj. 1T1-61102-BH-57)
(AD-A140408) Avail: NTIS HC A03/MF A01 CSCL 20/2

This report presents an assessment of the purification and preparation of large perfect single crystals of TNT. In the course of this examination, studies were made of the polymorphism of this material and the influence of impurities on growth twinning. The defect structure of the best crystals was defined using X-ray topographic techniques. Author (GRA)

N84-26426# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
CLUSTER CALCULATION OF ELECTRONIC STRUCTURE OF THE DIAMOND (111) SURFACE USING THE XALPHA-SCATTERED WAVE METHOD M.S. Thesis
W. T. McKeown Dec. 1983 135 p
(AF Proj. 2001)
(AD-A140486; AFWAL-TR-83-1130) Avail: NTIS HC A07/MF A01 CSCL 12/1

This report describes a computer-based calculation of the energy eigenvalues of electronics in the C5H9 diamond-structural complex, which serves as a cluster model of the diamond (111) surface. The report discusses the theoretical aspects of Hartree-Fock Theory, Self-Consistent-Field Theory and Scattering Theory. It also contains a discussion on the computer programs in a broad context, highlighting the general approach taken. Lastly, it discusses the calculated results for C5H9 and compares these with earlier work of others obtained using the same computational scheme applied to the C5H12 cluster as a model of crystalline diamond. The results are also compared with a published pseudo-

potential calculation of the diamond (111) surface which does not use a cluster approach. Good agreement with these calculations and with experiment is obtained for the energy gap in diamond. In addition the location and energy spread of the surface states which appear in the gap agree well with the pseudopotential calculation. The cluster method used thus appears promising for modeling surfaces and localized defects in covalently bonded solids having the diamond structure. Author (GRA)

N84-26427# Junta de Energia Nuclear, Madrid (Spain).
OPTICAL ABSORPTION AND THERMOLUMINESCENCE IN MgO:Ni AND MgO:Li IRRADIATED AT ROOM TEMPERATURE
L. Delgardo 1984 37 p refs In SPANISH; ENGLISH summary (JEN-556; ISSN-0081-3397) Avail: NTIS HC A03/MF A01

Optical absorption and thermoluminescence (TL) studies in MgO, MgO:N and MgO:Li irradiated at room temperature are presented. In pure MgO the thermal annihilation of Fe(3+) by recombination with thermally released electrons at approximately 90 and 175 C and the V center annealing by hole release up to 100 C cause the observed glow peaks of these temperatures. The TL excitation spectrum shows two maxima at 245 nm (electron center) and 288 nm (Fe(3+)). In MgO:Ni X irradiation introduces Fe(2+) yields Fe(3+) and Ni(2+) yields Ni(3+) oxidations. Two TL emission bands centered at 100 c (red) and 80 c (green) are assigned to electron release and their recombination at Fe(3+) and Ni(3+) respectively. No V center formation was detected in Ni and Li doped samples. Author

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

No abstracts in this category.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N84-26428# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE USE OF PHOTOINTERPRETATION FOR SOCIO-ECONOMIC CHARACTERIZATION OF URBAN POPULATION
Maria de Lourdes Neves deOliveira and Maria Suelana Santiago Barros Apr. 1984 8 p refs Presented at the 15th Intern. Symp. of Photogrammetry and Remote Sensing, Rio de Janeiro, Jun. 1984
(INPE-3067-PRE/484) Avail: NTIS HC A02/MF A01

The use of aerial panchromatic photography for analysis of urban residential environments in Brazilian towns is described. The lack of information about the discrimination of different segments of urban population according to their socio-economic characteristics, as required by urban planning process, motivated the develoment of this work. Through the examination of relevant physical aspects of residential areas, these are classified into groups, according to their socio-economic status. This classification was validated using survey data about total family income and the main householder's income. The results showed the usefulness of aerial photography for this purpose. Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-26429* National Aeronautics and Space Administration, Washington, D. C.
MANAGEMENT. A CONTINUING BIBLIOGRAPHY FOR NASA MANAGERS, WITH INDEXES
Mar. 1984 150 p
(NASA-SP-7500(18); NAS 1.21:7500(18)) Avail: NTIS HC $16.00 CSCL 05A

This bibliography lists 594 reports, articles and other documents introduced into the NASA scientific and technical information system in 1983. Author

N84-26430 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Abt. Wissenschaftliche-Technishe Information.
TECHNICAL AND SCIENTIFIC PUBLICATION 1983: RESEARCH AND DEVELOPMENT [TECHNISCHE WISSENSCHAFTLICHE VEROEFFENTLICHEN 1983: FORSCHUNG UND ENTWICKLUNG]
1983 360 p refs In ENGLISH and GERMAN
Copyright. Avail: Issuing Activity

Research and development in science and technology are reported. Topics discussed include: materials science and materials handling in aerospace engineering; transport aircrafts; rotary wings; space transportation, and computer techniques; defense technology; and civil engineering. For individual titles, see N84-26431 through N84-26452.

N84-26431 Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
ON IMPROVING THE FATIGUE PERFORMANCE OF A DOUBLE-SHEAR LAP JOINT c39
L. Schwarmann *In* MBB Tech. and Sci. Publ. 1983 1983 p 9-17 refs (For primary document see N84-26430 16-81)
(VFW-29/83-O) Avail: Issuing Activity

Different methods for improving the fatigue performance of a double-shear lap joint which is representative of airframe structures are discussed. Considering all aspects concerning fatigue performance, fabrication problems and costs, one method is recommended for practical application in aviation. This method involves the installation of cylindrical fasteners with a low degree of interference-fit into cold-worked holes. Author

N84-26432 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
MAGNETIC ROLL/YAW ATTITUDE CONTROL OF A MOMENTUM BIASED NEAR POLAR ORBIT SATELLITE c15
E. Bruederle and A. Reindler *In its* Tech. and Sci. Publ. 1983 1983 p 19-28 refs Presented at 9th IFAC/ESA Symp. on Automatic Control in Space 1982, Noordwijkerhout, Netherlands, 5-9 Jul. 1982 (For primary document see N84-26430 16-81)
(MBB-UR-629-83-O) Avail: Issuing Activity

Two magnetic attitude control laws, with Earth sensor and magnetometer measurements or with Earth sensor measurements only, are compared. Stability conditions are derived for both systems and simulation results are shown. Author

N84-26433 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Zentrallab.
CHARACTERIZATION OF ALUMINUM OXIDE LAYERS c26
H. E. Franz *In its* Tech. and Sci. Publ. 1983 1983 p 29-45 refs In GERMAN; ENGLISH summary Original language document announced as N84-16330 (For primary document see N84-26430 16-81)
(MBB-BB-549-83-O) Avail: Issuing Activity

Adhesive bonding of aluminum sheets is a manufacturing process which is very relevant in aircraft construction. In order to produce bonds featuring adequate strength and long-term stability, an aluminum oxide layer having certain properties must be

generated on the sheet surface during pretreatment. The properties of aluminum oxide layers which are required and adequate in the light of current findings are delineated and the analytics prepared for the purpose of checking these properties are presented. Al2O3 layers produced by means of pickling and chromic acid and phosphoric acid anodic oxidation can be characterized adequately by means of chemical composition (impurity), layer thickness, structure, and morphology. The following methods of physical analysis are employed in order to determine these properties: surface analysis (AES, ESCA, SIMS) in conjunction with ion etching for the obtention of depth profiles; electron diffraction in reflection and transmission as well as X-ray diffraction; high-resolution scanning electron microscopy (resolution 30 A); and transmission electron microscopy. M.G.

N84-26434 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Aircraft Div.
EXPERIMENTAL INVESTIGATION OF DELAMINATIONS IN CARBON FIBER COMPOSITE **c24**
W. Geier, J. Vilsmeier, and D. Weisgerber *In its* Tech. and Sci. Publ. 1983 1983 p 37-59 Presented at 56th AGARD SMP Panel Meeting/Specialists' Meeting on Characterization, Anal., and Significance of Defects in Composite Mater., London, 10-15 Apr. 1983 (For primary document see N84-26430 16-81)
(MBB-FE-214/S/Pub/107) Avail: Issuing Activity

Results concerning the effect of delaminations on static and fatigue strength of carbon fiber composites are presented. The delaminations were introduced artificially into solid laminates and sandwich structures by means of folded teflon patches. The effects of delaminations caused by low energy impact were also investigated. The tests have been carried out both at room temperature and at 120 C in the as received as well as the wet condition. For the sandwich structure design no loss in fracture strength could be found even in the case of fatigue and built-in delaminations. The same results are valid for the shear angle specimens. No significant loss in compression strength caused by 6 x 6 mm delaminations was found, although 12 x 12 and 12 x 25 mm delaminations show a considerable reduction in strength. The effect of delaminations caused by low energy impact was found to be no greater than that of a 6 mm open hole which is always taken into account in the design philosophy. M.G.

N84-26435 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
VORTEX FLAP SYSTEM FOR THIN WINGS [VORDERKANTEN-KLAPPENSYSTEME FUER SCHLANKT FLUEGEL: VORTEX FLAPS] **c02**
W. Staudacher *In its* Tech. and Sci. Publ. 1983 1983 p 61-84 refs In GERMAN Presented at DGLR Symp.: Leistungssteigerungen bei Flaechenflugzeugen, Frankfurt, 11-12 Nov. 1982 (For primary document see N84-26430 16-81)
(MBB-FE-122/S/Pub/102) Avail: Issuing Activity

Vortex flap systems for thin wings are discussed. The aerodynamic characteristics of mechanical vortex flap systems are examined. Whether the formation of stabile, rolled vortex flap turbulence is eliminated by thin wings, vortex flap and whether the vortex flaps are the right solution for the low induced resistance in far reachin use of nonlinear booster aerodynamic lift is investigated. Transl. by E.A.K.

N84-26436 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Flugzeuge.
CSTS: THE SOFTWARE TEST SYSTEM FOR THE TORNADO AUTO PILOT [CSTS: EIN SOFTWARE TESTSYSTEME FUER DEN TORNADO-AUTOPILOTEN] **c08**
J. Stocker and J. Rauch *In its* Tech. and Sci. Publ. 1983 1983 p 85-107 refs In GERMAN Presented at DGLR Symp.: Test U. Verifikation von Software bei Digitalen Systemen der Luft-U. Raumfahrt, Cologne, 25-26 Oct. 1983 (For primary document see N84-26430 16-81)
(MBB-FE-325/S/Pub/118) Avail: Issuing Activity

The validation of the safety of onboard computer software was tested by dynamic software tests on hardware/software integrated systems. The CSTS test system was developed to automate the test method on Tornado autopilots. Different software validation measurements in which the concept of the CSTS structure is employed are proposed. Transl. by E.A.K.

N84-26437 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich.
THE AIRBUS: THE STATE-OF-THE-ART TODAY, AND FUTURE DEVELOPMENTS [DER AIRBUS: HEUTIGER STAND UND ZUKUENFTIGE ENTWICKLUNGEN] **c05**
H. G. Klug *In its* Tech. and Sci. Publ. 1983 1983 p 109-118 In GERMAN Presented at Haus der Tech., Essen, 16 Nov. 1982 (For primary document see N84-26430 16-81)
(MBB-UT-22-83-O) Avail: Issuing Activity

The European collaboration on the European Airbus construction is reported. The historical background of the Airbus, and the contributions by the participating countries are enumerated. The structural characteristics, and the urther development and improvements are discussed. Transl. by E.A.K.

N84-26438 Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
GROUND AND INFLIGHT OPERATIONAL EFFECTS OF APU'S **c07**
J. H. Renken *In* MBB Tech. and Sci. Publ. 1983 1983 p 119-137 Presented at AGARD Propulsion and Energetics (PEP) Meeting/Specialists' Meeting on Auxiliary Power Systems, Copenhagen, 30-31 May 1983 (For primary document see N84-26430 16-81)
(VFW-30/83-O) Avail: Issuing Activity

The Airbus APU has to deliver well defined quantities of bleed air and electrical power under two very different conditions: on ground and inflight. The on ground operation is essentially governed by problems like noise generation and emission, and ingestion of hot gas, constraining the possible range of intake and exhaust position. The inflight operation is dominated by the external fuselage flow conditions intake and exhaust are exposed to and which may effect significantly the installation pressure-ratio and with that the inflight restart envelope and inflight performance. Depending on fuselage surface pressure and boundary layer conditions, intake and exhaust geometries and ducting have to be designed so that a favorable IPR is provided during APU starting as well as APU operation, keeping at the same time negative effects on the aircraft as for instance drag increase at minimum. The effect of these environmental conditions on the APU performance is discussed. E.A.K.

N84-26439 Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany). Werkstoff-und Verfahrenstechnik.
SUCCESSFUL UTILIZATION OF ECONOMIC, LIGHT ALUMINUM-CASTED STRUCTURES IN AIRPLANE CONSTRUCTION [ERFOLGREICHE EINFUEHRUNG WIRTSCHAFTLICHER UND LEICHTER ALUMINIUM-GUSSSTRUKTUREN IM FLUGZEUG-BAU] **c05**
D. Mietrach *In* MBB Tech. and Sci. Publ. 1983 1983 p 139-157 refs In GERMAN Presented at Lehrgang: Ontwerpen en Gieten van Hoogwaardige Construct., Delft, 19-20 Oct. 1983 (For primary document see N84-26430 16-81)
(VFW-31/83-O) Avail: Issuing Activity

Aluminum casting techniques in the aircraft industry are examined. The advantages of casting techniques, casting procedures and materials, directions for casters and quality control are described. New casting methods, test methods and possibilities, and reproducible castings are discussed. Transl. by E.A.K.

N84-26440 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Drehfluegler und Verkehr.
A PRINCIPAL ROTOR WITHOUT JOINTS AND PILLOWS, MADE OF FIBER MATERIALS, FOR DYNAMIC SYSTEMS OF FUTURE HELICOPTERS [GELENK- UND LAGERLOSER HAUPTROTROR IN FASERVERBUNDBAUWEISE FUER DYNAMISCHE SYSTEME ZUKUENFTIGER HUBSCHRAUBER] **c37**
M. Huber *In its* Tech. and Sci. Publ. 1983 1983 p 159-187 refs In GERMAN Presented at 3rd Bundesmin. fuer Forsch. u. Technol.

(BMFT)-Statusseminar: Luftfahrtforsch. u. Luftfahrttechnol., Hamburg, 2-4 May 1983 (For primary document see N84-26430 16-81)
(MBB-UD-384-83-O) Avail: Issuing Activity

The development of joint and bearingless main rotors for dynamic systems for helicopters is discussed. The performance, acceleration, durability and safety, and simultaneous reduction of production cost is outlined. Transl. by E.A.K.

N84-26441 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
A REAR ENGINE WITHOUT JOINTS AND PILLOWS [GELENK- UND LAGERLOSES HECKROTORSYSTEM IN FASERVERBUND-BAUWEISE] c37
H. Frommlet *In its* Tech. and Sci. Publ. 1983 1983 p 189-219 refs In GERMAN Presented at 3rd Bundesmin. fuer Fosch. u. Technol. (BMFT)-Statusseminar: Luftfahrtforsch. u. Luftfahrt-technol., Hamburg, 2-4 May 1983 Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N84-26430 16-81)
(MBB-UD-383-83-O) Avail: Issuing Activity

A new joint and bearingless tail rotor was developed. The bearings and joints, which cause the three blade movements, are replaced by a flexible bending/tension element made out of fiber composite materials. The moving rotor performance system was measured. It is found that the swing defector of the tail rotor can be improved. Transl. by E.A.K.

N84-26442 Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
THE THERMAL DESIGN OF THE EUROPEAN COMPLEMENT OF FIRST SPACELAB MISSION (FSLP) c16
U. Laux *In* MBB Tech. and Sci. Publ. 1983 1983 p 221-231 refs Presented at 13th Intersoc. Conf. on Environ. Systems, San Francisco, 11-13 Jul. 1983 (For primary document see N84-26430 16-81)
(MBB-UR-645-83-O; SAE-TPS-831144) Avail: Issuing Activity

The First Spacelab Mission (FSLP) is a joint ESA/NASA mission and is scheduled to be flown in September 1983. The European complement of FSLP consists of user provided experiments, ESA provided Mission Peculiar Equipment (MPE), and Spacelab hardware. The thermal accommodation concept for the European experiments and the design of the thermal MPE is presented. The thermal analysis approach and results are also discussed. For the thermal design, the use of Spacelab environmental control facilities is maximized. The instruments located inside the Spacelab module are thermally controlled entirely by baseline Spacelab facilities. The payload located on the pallet is cooled via a new freon cooling loop layout, which deviates from Spacelab Environmental Control System (ECS) baseline and which is determined by specific payload requirements. In addition, the thermal insulation principle of the pallet mounted equipment is introduced. M.G.

N84-26443 Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
A REVIEW OF THE IN-ORBIT THERMAL PERFORMANCE OF MARITIME COMMUNICATIONS SATELLITE (MCS)-A c15
D. Chalmers *In* MBB Tech. and Sci. Publ. 1983 1983 p 233-243 refs Presented at AIAA 18th Thermophys. Conf., Montreal, 1-3 Jun. 1983 (For primary document see N84-26430 16-81)
(MBB-UR-641-83-O) Avail: Issuing Activity

Details concerning the performance of the Thermal Control Subsystem over the initial 15 months of the mission are presented. The relevant telemetried data was processed to allow, using the thermal mathematical models as well as direct comparison methods, an evaluation of the in-orbit thermal behavior, and thus obtain an indication on how successfully the thermal control techniques and philosophy have performed. Particular attention was focussed on the technologies flying for the first time on a European satellite, i.e., the TPA heat pipe radiator and automatic electronic heater switching. Valuable information was obtained for future application, not only to MCS-A, but also for the family of ECS type satellites, of which MCS-A was the first. M.G.

N84-26444 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
STATUS AND FUTURE APPLICATION OF THE RF-PROPULSION SYSTEMS RITA INCLUDING INTERPLANETARY MISSIONS c20
H. Bassner and H. W. Loeb (Giessen Univ., West Germany) *In its* Tech. and Sci. Publ. 1983 1983 p 245-257 refs Presented at 34th IAF Congr., Budapest, 9-15 Oct. 1983 Original language document announced as A84-11805 (For primary document see N84-26430 16-81)
(MBB-UR-646-83-O) Avail: Issuing Activity

Radiofrequency ion thrusters RIT have been under development in the FRG since 1960. The RIT Assembly (RITA), using the 10-cm thruster RIT 10, has been developed and ground-qualified for orbit control of geostationary satellies. With a thrust level of 10 mN and a specific impulse of 31,000 Ns/kg, a mass of 10% can be saved for a 1500 kg satellite during 7 years. The first space test of the RITA-system is currently planned onboard the European Retrievable Carrier EURECA which will be launched and retrieved by the Space Shuttle in 1987. The 35 cm primary propulsion engine RIT 35, with thrust levels up to 200 mN has reached the state of a laboratory prototype. It is planned to develop a Solar Electric Acceleration Module SELAM by 1990, equipped with a 32 kW power array and a cluster of RIT 35 engines, which will be able to produce 1.2 N of thrust and 25 km/s of velocity increment. M.G.

N84-26445 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
TRANSPONDER OPTIMIZATION BY COMPUTER SIMULATION c32
Ottfried Baetz and Claus Peter Fischer *In its* Tech. and Sci. Publ. 1983 1983 p 259-260 refs In GERMAN; ENGLISH summary (For primary document see N84-26430 16-81)
(MBB-UR-617-83-O) Avail: Issuing Activity

In order to achieve an optimum transponder system design it is necessary to select or specify the appropriate components, like filters, mixers, amplifiers, etc. Since the various electrical characteristics of the transponder components and the quality of the overall transmission are related in a very complex way, a simple analytical approach is not practical. On the other hand, a completely experimental approach would not be time or cost effective. The simulation model (TOPSI) was created to solve this problem. A software package was implemented that consists of a large number of individual modules. Each module is dedicated to the simulation of a single transponder component, signal generator or signal analyser. The software modules may easily be integrated and configured to simulate a corresponding experimental test set-up. In this way, the system performance may be evaluated and the impact of a specific component parameter, e.g., a filter characteristic, may be determined. The architecture and the mathematical background of the simulation package are described. M.G.

N84-26446 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
ON VALIDATION OF MISSION SOFTWARE BY CLOSED-LOOP TESTING IN REALTIME c61
H. Neubauer *In its* Tech. and Sci. Publ. 1983 1983 p Presented at AGARD GCP 35th Panel Meeting/Symp. on Advan. in Guidance and Control Systems (CP-321), Lissabon, 11-15 Oct. 1982 (For primary document see N84-26430 16-81)
(MBB-UA-770-83-O) Avail: Issuing Activity

Some basic considerations on validation techniques for simulations and their application to a real-time digital computer simulation with hardware-in-the-loop (HWLL) are provided. The purpose of HWLL-simulations is the improvement of the simulation performance level comparable with that expected from the hardware and the validation of the operational software and hardware at system level. This can be accomplished by (1) using (open-loop) hardware test results to update and validate the

subsystem models, and (2) substitution of (flight-) hardware for subsystem models. M.G.

N84-26447 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
MULTIPROFILE-STREAK TECHNIQUE c35
Manfred B. Held and Peter P. Nikowitsch *In its* Tech. and Sci. Publ. 1983 1983 p 287-197 refs Presented at 15th Intern. Congr. on High Speed Phot. and Photonics, San Diego, Calif., 21-27 Aug. 1982 (For primary document see N84-26430 16-81)
(MBB-UA-776-83-O) Avail: Issuing Activity

Streak technique signifies stretching out, in terms of time, a process under observation, generally along a line. Here the event under observation is imaged via the main lens to the slit of the streak camera. Only the image of a narrow strip of the event which passes through this camera slit is shown via the camera lens and the rotating mirror on the film plane. On rotating of the mirror, a chronological record is retained, spatially stretched, on the film according to the speed of the camera. Three different methods based on streak recording can be defined depending on the velocity vector, position of the streak slit and the plane of the light beam defected upon the rotating mirror: velocity measurement, arrival time measurement; and profile measurement. These three techniques were employed in observing the detonation wave of cylindrical explosive charges. M.G.

N84-26448 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
CHARACTERIZING SHAPED CHARGE BY STAND-OFF BEHAVIOR c28
Manfred Held *In its* Tech. and Sci. Publ. 1983 1983 p 299-309 refs Presented at 7th Intern. Symp. on Ballistics Proc., The Hague, 19-21 Apr. 1983 (For primary document see N84-26430 16-81)
(MBB-UA-693-83-O) Avail: Issuing Activity

The stand-off-curve offers the possibility to assess the quality of the charge as well as to roughly investigate or predict its performance capability, including the residual penetration depth in realistic range targets. Two methods are explained for calculation of penetration in spaced armor targets with shaped charges based upon the stand-off-curve. The one uses proportional jet consumption (Fireman-Pugh) starting from the penetration of the actual stand-off, the other uses an iterated consumption of the individual jet tip regions by the spaced plates of the target, using the cut-off velocities as a function of stand-off. An outlook is given on the possible performance of a shaped charge in terms of the theoretical stand-off curve. M.G.

N84-26449 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
IMAGE QUALITY OF PASSIVE AND ACTIVE SCANNERS c35
Otto Hoffmann *In its* Tech. and Sci. Publ. 1983 1983 p 311-327 refs In GERMAN; ENGLISH summary (For primary document see N84-26430 16-81)
(MBB-UA-684-83-O) Avail: Issuing Activity

Besides photography from airplanes and spacecraft for carography, remote sensing imagery with active and passive scanners is gaining increased importance. This is particularly true for digital line cameras which use CCD-sensors in the so-called push-broom mode. The underlying physical and geometric principles, terms, and criteria are defined or deduced for evaluating the image quality. They are, among others, angular and distance resolution, sensor sensitivity and detectivity, scanning frequency, signal-to-noise ratio, quantization, spectral resolution, and the modulation transfer function. The image quality of three types of equipment are investigated: the digital opto-electronic line camera for imagery in the visible and near infrared spectrum; the opto-mechanical scanner for imagery in the intermediate and thermal infrared spectrum; and the side looking radar with real or synthetic antennas for imagery in the microwave spectrum. M.G.

N84-26450 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
NC-CONTROLLED MACHINE WITH A CABLE [NC-GESTEUERTE KABELVERLEGEMASCHINE] c37
Juergen Maskow and Peter Marr *In its* Tech. and Sci. Publ. 1983 1983 p 329-333 refs In GERMAN (For primary document see N84-26430 16-81)
(MBB-UT-21-83-O) Avail: Issuing Activity

A cable laying machine for wiring the European Airbus is examined. An integrated production line concept was developed which develops the cable bundle faster and in an ergonomically more favorable work place. Transl. by E.A.K.

N84-26451 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
IMPORTANT CAD/CAM UTILIZATION AT MBB [CAD/CAM-GROSSANWENDUNG BEI MBB] c61
Volkmar Antl *In its* Tech. and Sci. Publ. 1983 1983 p 335-340 In GERMAN (For primary document see N84-26430 16-81)
(MBB-Z-13-83-O) Avail: Issuing Activity

Computer aided design (CAD) and computer aided manufacturing (CAM) was used to solve special problems. It is useful in large production like construction and preparation time of materials is considerably shortened. By throughput reduction, cost reduction, quality improvement and solving new technological problems can the industry keep up with foreign competition. Transl. by E.A.K.

N84-26452 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
ENERGY SOURCE TODAY AND TOMORROW [BIOGAS EINE ENERGIEQUELLE VON HEUTE UND MORGEN] c44
Rolf August Brand *In its* Tech. and Sci. Publ. 1983 1983 p 341-353 In GERMAN (For primary document see N84-26430 16-81)
(MBB-UR-602-82-O) Avail: Issuing Activity

New energy sources and energy technology are discussed. The development of bioconversion into energy for domestic and industrial use is examined. The search for natural resources and the development of new technologies for energy production are outlined. Transl. by E.A.K.

N84-26453# Wissenschaftszentrum, Berlin (West Germany). Internationales Inst. fuer Vergleichende Gesselschaftsforschung.
INCREASE OF WORKER AUTONOMY AT THE INDUSTRIAL WORK PLACE AS SHOWN IN THREE HUMANIZATION PROJECTS IN SWEDEN, IN GREAT BRITAIN AND IN THE USA Final Report, Oct. 1981
Peter Auer, Boris Penth, and Peter Tergeist Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 187 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-83-031; ISSN-0171-7618) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35,50

The concept of increasing worker autonomy, which represents an important action oriented aspect of the general HdA debate is outlined. It establishes different concepts of increased autonomy on gains incentives for the West German approach. The Volvo-Kalmar is undertook. The innovative project for work restructuring, the distribution of work time and a gain in recreational time by increased worker decision making is emphasized. Lucas Aerospace represents the example of an alternative product design brought forth by employees, which raises the question of what to produce in addition to changes in job content. E.A.K.

N84-26454# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
PROJECT MANAGEMENT IN THE 80'S [PROJEKTMANAGEMENT IN DEN 80ER JAHREN]
Bernd-J. Madauss 17 Nov. 1983 30 p In GERMAN Presented at GPM Jahrestagung, Wuerzburg, West Germany, 17-18 Nov. 1983
(MBB-UR-631-83-O) Avail: NTIS HC A03/MF A01

Present and future project management characteristics in the aerospace industry are outlined. Topics discussed include: complex system analysis; interdisciplinary task requirements; governmental

and industrial common tasks; international cooperation; budget and finance problems. Transl. by E.A.K.

N84-26455# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
THE ONERA AERONAUTICS RESEARCH ESTABLISHMENT IN CANNES (FRANCE) [L'ESTABLISSEMENT ONERA DE CANNES AU SERVICE DE LA RESEARCH AERONAUTIQUE]
Amede Bevert 1983 116 p refs In FRENCH Report will also be announced as ESA-TT-875
(ONERA-P-1983-2; ISSN-0078-379X) Avail: NTIS HC A06/MF A01

The origins, characteristics, equipment, and first tests conducted at the wind tunnel in Cannes are reviewed as well as historical reasons for its location in that city. Further evolution of equipment and the types of tests conducted are described. Research themes include: wing bending; high lift by internal and external blowing; ground effect; vertical takeoff and landing aircraft; ground effect vehicles; supersonic transport aircraft; aircraft with variable bending; the European Airbus; and aerodynamics and active control. Transl. by A.R.H.

N84-26456# Ecole Nationale Superieure de Techniques Avancees, Paris (France).
[RESEARCH ACTIVITIES IN ADVANCED TECHNIQUES] Annual Report, 1982 [RAPPORT DACTIVITE SUR LES RECHERCHES A L.E.N.S.T.A. EN 1982]
12 Mar. 1982 125 p refs In FRENCH Original doc. contains color illustrations
Avail: NTIS HC A06/MF A01

Progress and achievements are reported in studies related to naval hydrodynamics; interface phenomena; composite structures and materials; combustion thermochemistry; energetics; applied optics, chemical reactors; the development of 2D and 3D geometric algorithms; data structures; man machine communication; and computer graphics. Publications, including theses are listed. Transl. by A.R.H.

N84-26457# Mitre Corp., Bedford, Mass.
PRELIMINARY PROGRAM MANAGER'S GUIDE TO ADA Final Report
R. G. Howe, W. E. Byrne, E. C. Grund, R. F. II Hilliard, and R. G. Munck Feb. 1984 86 p
(Contract F19628-82-C-0001; AF Proj. 5720)
(AD-A140347; WP-25012; ESD-TR-83-255) Avail: NTIS HC A05/MF A01 CSCL 05/1

This draft guide provides current information that should help a Program Manager in making decisions relative to the use of Ada. It discusses pertinent Air Force and DoD policy, effects of Ada on contractual documentation, and steps that must be taken to apply Ada. This guide identifies benefits and inherent risks of using Ada, and Program Office initiatives needed to control risk. It cites factors that will affect programmer training, software cost and schedule estimation, design, and configuration management. As background information, the basic features of Ada and the software needed to support programming in Ada are described. The guide will be issued after review. Author (GRA)

N84-26458# Wisconsin Human Information Processing Program, Madison.
RISK AND DISTRIBUTIONAL INEQUALITY Interim Report
L. L. Lopes Mar. 1984 42 p
(Contract N00014-84-K-0065)
(AD-A140373; WHIPP-20) Avail: NTIS HC A03/MF A01 CSCL 05/1

A distributional model of risk is described in which it is hypothesized that people's judgments of risk are similar to the kinds of judgments made in welfare economics concerning inequality of income distributions. The role played by the Lorenz curve in analyzing inequality is described and it is shown how Lorenz curves can be used to describe risks. Two hypotheses are presented concerning risk: first, that representing risks with Lorenz curves will be useful in capturing the salient psychological features of risk, and second, that people's judgments of positive risks will be similar functionally to judgments of distributional inequality. Six experiments are presented that support the distributional model of risk for both preference judgments and judgments of riskiness. The implications of these experiments are described and the distributional model is compared with alternative models of risk. GRA

N84-26459# Utah Univ., Salt Lake City. Dept. of Physics.
QUANTUM SOLUTIONS AND STRANGE SOLUTIONS IN MANY-BODY PROBLEMS Final Report, 1 Jul. 1981 - 31 May 1983
D. C. Mattis 1 Jul. 1983 6 p
(Grant AF-AFOSR-0257-80; AF Proj. 2304)
(AD-A140436; AFOSR-84-0242TR) Avail: NTIS HC A02/MF A01 CSCL 05/1

A summary is given of research accomplished and papers written under this grant. The research covered statistical and many-body theoretical physics, especially, new mathematical techniques for solving problems. Author (GRA)

N84-26460# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF NAVAL AVIATION CONFIGURATION STATUS ACCOUNTING M.S. Thesis
M. A. Snyder and T. F. Snyder Dec. 1983 125 p
(AD-A140473) Avail: NTIS HC A06/MF A01 CSCL 05/1

Naval Aviation configuration status accounting and its interface with the present and future prescribed and locally developed information systems is reviewed. It was determined that the lack of coordination, integration and standardization resulting from the proliferation of locally developed systems decreases logistic support and maintenance management effectiveness. It is recommended that the prescribed Naval Aviation configuration status accounting system and the proliferation of local systems be consolidated into a single integrated system. NALCOMIS, a program currently under development, has the potential to meet all user requirements with minor expansion to its current design. Author (GRA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-26461 Northwestern Univ., Evanston, Ill.
FUNCTIONS IN FIRST ORDER DATA BASES Ph.D. Thesis
Mohammad Ghafarzadeh 1983 77 p
Avail: Univ. Microfilms Order No. DA8403423

A method to deal with Skolem functions (intensional entities) in first-order data bases is presented. An example of a situation in which these functions are used is to express the fact that everyone has a mother. In logical form, this fact is to be represented as for every person, x, there is a women, y, for whom the relation Mother (x,y) holds. That is, a clause such as Mother (x,m(x)) is to be present in the data base. The solution involves a revised form of resolution, called conditional-resolution, and a verification procedure. The idea is to accept values or functions conditionally, during resolution, leaving their evaluation for after the resolution is done. In this way the intentional data base is compiled at data base creation time. Subsequently, at query evaluation time, proper proofs are combined to yield all answers for that query. Dissert. Abstr.

N84-26462# Case Western Reserve Univ., Cleveland, Ohio.
THE RELATIONSHIP BETWEEN EXHAUSTIVITY AND CONSISTENCY AT THE OPTIMUM INDEXING LEVEL Ph.D. Thesis
Ben Oviss Oruma 1983 165 p
Avail: Univ. Microfilms Order No. DA840250

The product of human indexing is superior in performance to

that of automatic indexing. But human indexing is beset by the persistent problem of inconsistency. Inconsistency was identified as the major bottleneck associated with manual indexing. This age long problem has so far defied conventional remedies. The present investigation proposes that while inconsistency would occur as a rule, an optimum consistency is achieved for each indexing exercise by the interplay of the changes in consistency values with different levels of exhaustivity. This hypothesis states that a definite relationship is shown to exist between the optimum consistency level and a specific and predictable level of exhaustivity. The optimum consistency level coincides exactly with the optimum exhaustivity level in which case the latter, which was long advocated as a criterion for determining the terminal indexing point, would be authenticated as an appropriate criterion.
Dissert. Abstr.

N84-26463# Case Western Reserve Univ., Cleveland, Ohio.
A COMPUTER ALGORITHM FOR CORRECTING SPELLING AND TYPOGRAPHICAL ERRORS IN SUBJECT HEADINGS Ph.D. Thesis
Diane Vizine-Goetz 1983 108 p refs
Avail: Univ. Microfilms Order No. DA8405262

A technique for correcting spelling and typographical errors in subject headings occurring in topical and geographic subject heading fields of bibliographic records is tested. A three phase error correction procedure is employed. All errors of addition, omission, substitution, and transposition are identified. Corrections are also made for variations in spacing, punctuation, and capitalization overall, 80% of pairings to identify all occurrences of addition, omission, substitution, and transposition errors are valid. The most common error type corrected is omission. Transposition errors are the least frequently occurring error type. A technique to correct MARC tag and subfield code errors. The practical implication of these findings is that errors of the three types corrected for: (1) spelling/typographical errors, (2) spacing, punctuation, and capitalization variants, and (3) MARC tag and subfield code errors are pervasive in topical and geographic subject heading fields. The correction of a majority of such errors is feasible using the error correction procedures described. Dissert. Abstr.

N84-26464# Case Western Reserve Univ., Cleveland, Ohio.
A STUDY OF CONFERENCE PUBLICATION RECORDS IN OCLC: SOME IMPLICATIONS FOR THE FORMULATION AND APPLICATION OF CATALOGING RULES Ph.D. Thesis
Kul Bhushan Gauri 1983 189 p
Avail: Univ. Microfilms Order No. DA8405245

The performance of a set of rules in the current shared cataloging environment are investigated in an effort towards providing empirical support to the formulation of the rules. The rules on choice and form of headings of the 1967 Anglo-American Cataloging Rules (AACR 1) for cataloging conference publications are selected. Bibliographic records of eighty two conferences of the Institute of Electrical and Electronics Engineers, Inc. (IEEE), retrieved from the Online Computer Library Center (OCLC) database, comprised the data. Only forty records in eleven conferences show inconsistent and/or variant headings in the conference names proper. Unequivocal contents of rules, ascertainableness of elements in the prescription and construction of headings, and cost/benefit considerations are important factors in the application of the rules. Dissert. Abstr.

N84-26465# Oak Ridge National Lab., Tenn.
AN ANNOTATED BIBLIOGRAPHY COVERING GENERATION AND USE OF EVALUATED CROSS SECTION UNCERTAINTY FILES
R. W. Peelle and T. W. Burrows (Brookhaven National Lab.) Mar. 1983 33 p
(Contracts W-7405-eng-26; DE-AC02-76CH-00016)
(BNL-NCS-51684; ENDF-3311; TIC-4500) Avail: NTIS HC A03/MF A01

More than 60 literature references related to definition, generation, and use of evaluated cross section uncertainty (variance-covariance) files are listed with comments intended primarily to guide the reader toward materials of immediate interest. Papers are also cited that cover covariance information for individual experiments and that relate to production and use of multigroup covariance matrices. Titles are divided among several major categories. Author

N84-26466# National Science Foundation, Washington, D.C. Div. of Industrial Science and Technological Innovation.
THE PROCESS OF TECHNOLOGICAL INNOVATION: REVIEWING THE LITERATURE
Louis G. Tornatzky, J. D. Eveland, Myles G. Boylan (Colby Coll.), William A. Hetzner, Elmima C. Johnson, David Roitman (Michigan State Univ.), and Janet Schneider (Tennessee Univ.) May 1983 278 p refs
Avail: NTIS HC A13/MF A01

A literature overview in the fields and subfields generically known as innovation process research is presented. Several different disciplines and research traditions are included. Different concepts can go by similar names, and the same concepts are found under different guises and in different places. No single organizing framework is adequate for integrating all the diverse themes. The integrating approach which was chosen to starts with the idea that technological innovation must be considered in an organizational context. This focus is relevant for two related reasons: (1) most significant innovations require the mobilization of organizational resources to be effectively utilized, and thus are inherently bound up with the dynamics of organization behavior; (2) many previous reviews of innovation research have focused either on macro variables such as tax or social policies or on micro variables such as characteristics of innovation adopters, to the frequent exclusion of the organizational contexts in which the effects of these variables are played out. The full array of variables employed in previous innovation research are considered. E.A.K.

N84-26467*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TECHNICAL PUBLICATIONS OF THE NASA WALLOPS FLIGHT FACILITY, 1980 THROUGH 1983
J. N. Foster Jun. 1984 47 p
(NASA-TM-84421; NAS 1.15:84421) Avail: NTIS HC A03/MF A01 CSCL 05B

This bibliography lists the publications sponsored by the NASA Wallops Flight Center/NASA Goddard Space Flight Center, Wallops Flight Facility during the period 1980 through 1983. The compilation contains citations listed by type of publication; i.e., NASA formal report, NASA contractor report, journal article, or presentation; by contract/grant number; and by accession number. Oceanography, astrophysics, artificial satellites, fluid mechanics, and sea ice are among the topics covered. R.J.F.

N84-26468*# National Aeronautics and Space Administration, Washington, D. C.
THE PILOT LAND DATA SYSTEM: REPORT OF THE PROGRAM PLANNING WORKSHOPS
Jul. 1984 167 p refs
(NASA-TM-86250; NAS 1.15:86250) Avail: NTIS HC A08/MF A01 CSCL 05B

An advisory report to be used by NASA in developing a program plan for a Pilot Land Data System (PLDS) was developed. The purpose of the PLDS is to improve the ability of NASA and NASA sponsored researchers to conduct land-related research. The goal of the planning workshops was to provide and coordinate planning and concept development between the land related science and computer science disciplines, to discuss the architecture of the PLDs, requirements for information science technology, and system evaluation. The findings and recommendations of the Working Group are presented. The pilot program establishes a limited scale distributed information system to explore scientific, technical, and management approaches to satisfying the needs of the land science community. The PLDS paves the way for a land data system to improve data access, processing, transfer, and analysis, which land sciences information synthesis occurs on a scale not

previously permitted because of limits to data assembly and access. E.A.K.

N84-26469# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
FINAL NETWORK: OBJECTIVES, SCOPES, BENEFITS
W. Sobotta 18 Oct. 1983 16 p Presented at Sea Technol. Europe Symp. on High Technol. in European Ports and Shipping, Brussels, 18-19 Oct. 1983; sponsored by Commission of the European Communities
(MBB-UR-670-83-O) Avail: NTIS HC A02/MF A01

System requirements of the EVHA data processing and communications program are examined. Technology assessment and equipment evaluation is included as well as managerial and financial analysis of the system. M.A.C.

N84-26470# European Space Agency, Paris (France).
CATALOG OF ESA PUBLICATIONS IN 1983
B. Battrick, comp. Feb. 1984 62 p
(ESA-SP-105) Avail: NTIS HC A04/MF A01

Publications of the European Space Agency are listed. Aerodynamics, spacecraft design and propulsion, electrical engineering, energy technology, and computer programming are among the many topics covered. R.J.F.

N84-26471# Clemson Univ., S.C.
UNIFIED DATABASE DEVELOPMENT PROGRAM Final Report
E. L. Thomas, Jr. and R. N. Deem Brooks AFB, Tex. Air Force Human Resources Lab. Mar. 1984 110 p
(Contract F33615-79-C-0027; AF Proj. 1710)
(AD-A140309; AFHRL-TR-83-52) Avail: NTIS HC A06/MF A01 CSCL 15/5

The objective of the unified database (UDB) program was to develop an automated system that would be useful to those responsible for the design, development, testing, and support a new Air Force aircraft weapon system. Primary emphasis was on development of an historical logistics data repository system to provide convenient and timely access to relevant information about existing aircraft weapon systems, development of a fully automated logistics support analysis record system that would satisfy current Air Force and Department of Defense requirements, and develop the overall UDB system to function as a closed-loop system for use throughout the life of a weapon system. This report summarizes the accomplishments of the UDB program to data and describes the major features and capabilities of the UDB system. GRA

N84-26472# Army War Coll., Carlisle Barracks, Pa.
TECHNOLOGY TRANSFER DICHOTOMIES
H. C. Race 23 Dec. 1983 28 p
(AD-A140387) Avail: NTIS HC A03/MF A01 CSCL 05/1

Domestic Technology Transfer is the positive exchange of information among the members of the scientific and engineering communities within the US, both defense and non-defense related. Technology export can be intentional or non-intentional, and the results can produce strategic benefits/detriments to the nation's economic, political, and military goals. The dichotomy and the dynamics of the national policies and directives on these two aspects of technology transfer are frequently discussed. The roles of personnel in the government lab, industrial R&D center, and the university research facility must be delineated, and guidance provided on how to separate classified information from unclassified military significant technology, and from other unclassified technology information. The active participant role for the technical subject matter expert is necessary to accomplish national security objectives through encouraging domestic technology transfer and preparing accurate technology assessments for considerations in export control case processing. GRA

N84-26473# Rochester Univ., N. Y. Dept. of Computer Science.
THE ROE FILE SYSTEM
C. S. Ellis and R. A. Floyd Mar. 1983 20 p
(Contract N00014-82-K-0193; Grants NSF IST-80-25761; NSF MCS-91-04008)
(AD-A140497; TR-119) Avail: NTIS HC A02/MF A01 CSCL 09/2

ROE is a network-wide file system being developed for a heterogeneous local network. The system has been designed for two purposes: to serve as a testbed for experimenting with various policies for file migration and distribution strategies and to provide users with a logically coherent file system that takes advantage of distributed and diverse resources. The system is a synthesis of solutions to the problems of ensuring consistency of replicated data, allowing transparent reconfiguration, and providing adequate file accessibility. This report describes what has been accomplished so far in the ROE project. We outline the assumed environment, the basic structure of ROE, and the functions provided. Mechanisms are presented that allow migration, replication of file objects, and replication of access information to work together. Finally, the state of the implementation to date is described. Author (GRA)

N84-26474# Northwestern Univ., Evanston, Ill.
OPTIMIZATION OF QUERY PROCESSING IN DISTRIBUTED DATABASES SYSTEMS Ph.D. Thesis
Goker Gursel 1983 219 p
Avail: Univ. Microfilms Order No. DA8403427

The problem of processing simple queries, a frequently used subset of tree queries, in special networks that are not necessarily restricted to a completely connected topology is discussed. A nonredundant materialization of the distributed data base is assumed. Minimization of the total volume of data transmissions is considered to be the optimization objective. A dynamic programming algorithm based on the recursive structure of the traversal tree is developed. The algorithm derives the optimal strategy to process the simple query in the so called chain network without going through an exhaustive search. The algorithm is then progressively improved over several variants. Although the algorithm is intended for static query processing, it can also be extended for dynamic query processing. The performance of the algorithm is data base state dependent. Its time complexity is shown to be O(n) in the best case and O(n to the 3rd power) in the worst case, where n is the number of the data base relations referenced by the query. Its space complexity is O(n squared). Dissert. Abstr.

N84-25730# Royal Aircraft Establishment, Farnborough (England). Test Operations Div.
DATA ACQUISITION AND PROCESSING IN SEA-LEVEL TEST BEDS
M. Holmes, P. G. Booker, and B. M. Watts *In* AGARD Operational and Performance Meas. on Eng. in Sea Level Test Facilities Mar. 1984 17p (For primary document see N84-25723 16-09)
Avail: NTIS HC A09/MF A01

N84-25898*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Office of Telecommunications and Data Acquisition.
TDA ASSESSMENT OF RECOMMENDATIONS FOR SPACE DATA SYSTEM STANDARDS
E. C. Posner and R. Stevens *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 75-85 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 05B

N84-25977# International Business Machines S. A. E., Madrid (Spain). Scientific Center.
POST-PROCESSING: EXTRACTING AND DISPLAYING USEFUL INFORMATION FROM DIGITAL IMAGES
Javier Jimenez *In* Von Karman Inst. for Fluid Dyn. Digital Image Processing in Fluid Dyn. 1984 23 p refs (For primary document see N84-25973 16-34)
Avail: NTIS HC A19/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N84-26475# Office of Technology Assessment, Washington, D.C.
INTERNATIONAL COMPETITIVENESS IN ELECTRONICS
Nov. 1983 546 p refs
(PB84-170695; OTA-ISC-200) Avail: NTIS HC A23/MF A01 CSCL 05C

This assessment, requested by the Senate Committee on Commerce, Science, and Transportation, the House Committee on Ways and Means, and the Joint Economic Committee, completes a series of three reports on the competitiveness of U.S. industries. Today, the subject of international competitiveness has more visibility among the general public than ever before. It emerged as one of the primary economic issues facing Congress. Debates over 'reindustrialization' and 'industrial policy' beginning several years ago were renewed. This assessment continues the Office of Technoloy Assessment's exploration of the meaning of industrial policy in the U.S. context, while also examining the industrial policies of several of our economic rivals. Five options for a U.S. industrial policy, drawing on electronics for examples of past and prospective impacts, as well as on OTA's previous studies of the steel and automobile industries, are outlined.
Author (GRA)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N84-26476# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATIONS BILL, 1985
Washington GPO 1984 116 p Rept. to accompany H. R. 5713 presented by the Comm. on Appropriations, 98th Congr., 2nd Sess., 7 Jun. 1984
(S-Rept-98-506; GPO-35-356) Avail: US Capitol, Senate Document Room

Federal aappropriations for the Department of Housing and Urban Development and for sundry independent agencies, boards, commissions, corporations, and offices are enumerated and discussed. Recommendations by the House Committee on Appropriations are given along with a detailed description of each program considered. Specific programs discussed include: urban research, urban development, urban planning, solar energy, environmental quality, space stations, space shuttle orbiters, scientific research and education, and selective service. This bill, H.R. 5713, makes appropriations for the fiscal year ending September 30, 1985. For individual titles, see N84-26477 through N84-26477.

N84-26477# Committee on Appropriations (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
In its Dept. of Housing and Urban Develop.-Independent Agencies Appropriation Bill, 1985 1984 p 63-71 (For primary document see N84-26476 16-84)
Avail: US Capitol, Senate Document Room

Federal appropriations for various NASA programs are enumerated and discussed. Recommendations by the House Committee on Appropriations are given along with a detailed description of each program considered. This bill, H.R. 5713, makes appropriations for the fiscal year ending September 30, 1985: Specific NASA programs and research projects discussed include: the space station, space shuttle orbiters, spacelab, Gamma Ray Observatory, Galileo project, space telescopes, Atlas Centaur launch vehicles, robotics, Venus probes, and Mars probes. R.S.F.

N84-26478# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATION ACT, 1985
Washington GPO 1984 58 p H. R. 5713 referred to the Comm. on Appropriations, 98th Congr., 2nd Sess., 7 Jun. 1984
(S-Rept-98-506) Avail: US Capitol, Senate Document Room

The text of House Resolution 5713, making appropriations for urban projects, university housing projects, toxic waste disposal management, emergency relief, and national flood insurance is given. For individual titles, see N84-26479 through N84-26479.

N84-26479# Committee on Appropriations (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION: RESEARCH AND DEVELOPMENT
In its Dept. of Housing and Urban Develop.-Independent Agencies Appropiation Act, 1985 1984 p 27-34 (For primary document see N84-26478 16-84)
Avail: US Capitol, Senate Document Room

That part of the text of House resolution S713, authorizing appropriations to the General Services Administration for the expenses of Consumer Information Center activities and for National Aeronautics and Space Administration's contract to amortize the Central Engineering Building for the California Institute of Technology is given. R.J.F.

N84-26480# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATION ACT, 1985
Washington GPO 1984 59 p H. R. 5713 enacted into law by the 98th Congr., 2nd Sess., 21 Jun. 1984
Avail: US Capitol, Senate Document Room

Federal appropriations for the Department of Housing and Urban Development and for sundry independent agencies, boards, corporations, and offices are enumerated for the fiscal year ending September 30, 1985. Among the projects receiving funding allocations are: urban development; urban planning; urban research; NASA programs including the space station, artificial satellites, and robotics; toxic hazard reparations, environmental quality, and Antarctic research. For individual titles, see N84-26481 through N84-26481.

N84-26481# Committee on Appropriations (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
In its Dept. of Housing and Urban Develop.-Independent Agencies Appropriation Act, 1985 1984 p 28-34 (For primary document see N84-26480 16-84)
Avail: US Capitol, Senate Document Room

Federal appropriations for various NASA programs are enumerated for the fiscal year ending September 30, 1985. Monies were allocated to such projects as the space station, communications, artificial satellites, and robotics. R.S.F.

N84-26482# Office of Technology Assessment, Washington, D.C.
REPORT TO CONGRESS OF THE OFFICE OF TECHNOLOGY ASSESSMENT Annual Report, 1 Jan. - 30 Sep. 1983
Mar. 1984 79 p refs
(PB84-173814; OTA-A-226) Avail: NTIS HC A05/MF A01 CSCL 05A

The activities of the Office of Technology Assessment for the calendar year 1983 are discussed. Included are discussions of its organization and operation, summaries of assessments completed during 1983, descriptions of work in progress, and a list of staff members, advisors, and panel members. A copy of the Technology Assessment Act of 1972 is also included. The Office of Technology Assessment (OTA) was established by the Technology Assessment Act of 1972 (Public Law 92484) to provide the Congress with the new effective means for securing competent, unbiased information concerning the physical, biological, economic, social, and political effects of technological applications. GRA

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-26483*# Ecosystems International, Inc., Crofton, Md.
RAILROAD SAFETY PROGRAM, TASK 2 Final Report
Oct. 1983 144 p
(Contract NASw-3789)
(NASA-CR-173598; NAS 1.26:173598) Avail: NTIS HC A07/MF A01 CSCL 13F

Aspects of railroad safety and the preparation of a National Inspection Plan (NIP) for rail safety improvement are examined. Methodology for the allocation of inspection resources, preparation of a NIP instruction manual, and recommendations for future NIP, are described. A statistical analysis of regional rail accidents is presented with causes and suggested preventive measures included. M.A.C.

N84-26484*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REAL-TIME SIMULATION OF AN AUTOMOTIVE GAS TURBINE USING THE HYBRID COMPUTER Final Report
William Costakis and Walter C. Merrill May 1984 26 p
(Contract DE-AI01-77CS-51040)
(NASA-TM-83593; E-1994; DOE/NASA/51040-52; NAS 1.15:83593) Avail: NTIS HC A03/MF A01 CSCL 13F

A hybrid computer simulation of an Advanced Automotive Gas Turbine Powertrain System is reported. The system consists of a gas turbine engine, an automotive drivetrain with four speed automatic transmission, and a control system. Generally, dynamic performance is simulated on the analog portion of the hybrid computer while most of the steady state performance characteristics are calculated to run faster than real time and makes this simulation a useful tool for a variety of analytical studies. Author

88 SPACE SCIENCES (GENERAL)

N84-26485# Royal Observatory, Edinburgh (Scotland).
PROCEEDINGS OF THE WORKSHOP ON LABORATORY AND OBSERVATIONAL INFRARED SPECTRA OF INTERSTELLAR DUST Occasional Report of the Royal Observatory No. 12
R. D. Wolstencroft, ed. and J. Mayo Greenberg, ed. 1984 182 p refs Workshop held in Hilo, Hawaii, 18-20 Jul. 1983
(ISBN-0-902553-29-1; ISSN-0309-099X) Avail: NTIS HC A09/MF A01

Results concerning the nature of interstellar dust as derived from laboratory and observational infrared spectra are discussed. Emphasis is given to the possible sources, formation mechanisms, and composition of dust grains. For individual titles, see N84-26486 through N84-26508.

N84-26486# Huygens Laboratium, Leiden (Netherlands). Lab. Astrophysics.
EVOLUTION OF INTERSTELLAR GRAINS c90
J. Mayo Greenberg *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 1-25 refs (For primary document see N84-26485 16-88)
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The properties of interstellar grains are derived as a probe of local physical conditions and as a basis for predicting such properties as related to infrared emissivity and radiative transfer which can affect the evolution of dense clouds. The criteria for grain models are developed based directly on observations of gas and dust. A summary of the chemical evolution of grains and gas in diffuse and dense clouds follows. Author

N84-26487# Colorado Univ., Boulder.
GRAIN DESTRUCTION IN INTERSTELLAR SHOCKS c90
C. Gregory Seab and J. Michael Shull (Colorado Univ.) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 26-32 refs (For primary document see N84-26485 16-88)
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One of the principal methods for removing grains from the interstellar medium (ISM) is to destroy them in shock waves. Previous theoretical studies of shock destruction have generally assumed only a single size and type of grain; most do not account for the effect of the grain destruction on the structure of the shock. Earlier calculations were improved in three ways: first, by using a complete grain model including a distribution of sizes and types of grains; second, by using a self-consistent shock structure that incorporates the changing elemental depletions as the grains are destroyed; and third, by calculating the shock-processed ultraviolet extinction curves for comparison with observations. The results of these calculations are summarized. M.G.

N84-26488# Texas Univ., Austin. Dept. of Astronomy.
ON SUPERNOVAE AS A SOURCE OF INTERSTELLAR DUST: THE CURRENT OBSERVATIONAL PICTURE c90
Harriet L. Dinerstein *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 33-35 refs (For primary document see N84-26485 16-88)
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Supernovae have been generally thought of as being effective agents for the destruction of ambient interstellar dust. The idea that supernovae may also be a source of dust has been of interest recently, and is attractive for a couple of reasons. The main motivation is to explain meteoritic inclusions with peculiar isotopic abundance ratios as supernova dust condensates predating the solar nebula. In addition, although the nucleation process is not fully understood, the high concentration of condensable elements in the supernova mantle suggests the possibility that grain formation could be very efficient. In this case, supernovae could be a major source of new grain cores to the interstellar medium. In the last few years, several galactic novae have been observed to develop thermal infrared components with temperatures of about 1000 K, on the order of 50 days after the initial flare-up. The development of this infrared component has been interpreted as indicating the condensation of new grains. Evidence for dust formation soon after nova outbursts is interesting because of similarities between conditions in the nova shell to those in supernova ejecta. The current observational evidence with respect to dust formation in supernovae is summarized. M.G.

N84-26489# Kyoto Univ. (Japan). Dept. of Physics.
GRAIN FORMATION IN THE EXPANDING GAS FLOW AROUND COOL LUMINOUS STARS c90
Hiroichi Hasegawa *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 36-40 refs (For primary document see N84-26485 16-88)
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The important sources of interstellar grains are considered to be cool luminous mass loss stars. As the ejected gas is expanding, its temperature decreases. For a given pressure, the equilibrium temperature T(e) is set by the condition of coexistence of gas and condensed phase with infinite size. Even if the gas temperature reaches T(e), the condensation does not start immediately. Clusters, the aggregates of atoms or molecules of condensable material, should be produced and grow. The size of the cluster which can grow is larger than a critical size determined by the surface tension of condensing material and the supersaturation ratio S = (vapor pressure)/(saturation pressure). The critical sized cluster is called the nucleus and its production rate J is called nucleation rate. The nucleation rate is very sensitive to S, and increases significantly when S exceeds a certain value. According

to the theory of Yamamoto and Hasegawa (1977), the grain formation process is controlled by two mechanisms, the growth of nuclei and the consumption of vapors. This theory is extended to the case of a rapidly expanding gas. M.G.

N84-26490*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE COMPOSITION OF INTERSTELLAR GRAIN MANTLES **c90**
A. G. G. M. Tielens *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 41-48 refs (For primary document see N84-26485 16-88)
Avail: NTIS HC A09/MF A01

The molecular composition of interstellar grain mantles employing gas phase as well as grain surface reactions is studied. The calculated mixtures consist mainly of the molecules H2O, H2CO, N2, CO, O2, CO2, H2O2, NH3, and their deuterated counterparts in varying ratios. The exact compositions depend strongly on the physical conditions in the gas phase. The calculated mixtures are compared to the observations by using laboratory spectra of grain mantle analogs. The two are in reasonable agreement except for the strength of the 6.8-micrometers band. A possible solution for this discrepancy is discussed. Finally, future observations are suggested which may shed further light on the composition of interstellar grain mantles. B.W.

N84-26491# Kyoto Univ. (Japan). Dept. of Physics.
HETEROGENEOUS CONDENSATION OF ICE MANTLE AROUND SILICATE CORE GRAIN IN MOLECULAR CLOUD **c90**
Hiroichi Hasegawa *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 49-55 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

Interstellar water ice grains are observed in the cold and dense regions such as molecular clouds, HII regions and protostellar objects. The water ice is formed from gas phase during the cooling stage of cosmic gas with solid grain surfaces of high temperature silicate minerals. It is a question whether the ice is formed through the homogeneous condensation process (as the ice alone) or the heterogeneous one (as the ice around the pre-existing high temperature mineral grains). Author

N84-26492# Kapteyn Astronomical Lab., Groningen (Netherlands).
SPECTROSCOPY OF THE 4.6 - 4.7 MICRON INTERSTELLAR ABSORPTION FEATURES **c89**
T. R. Geballe *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 56-60 refs (For primary document see N84-26485 16-88)
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Perhaps the most successful application of spectroscopy to the study of interstellar solid state infrared absorption features has been in the case of the previously unidentified feature near 4.6 micrometers first seen in absorption toward the protostar W33A by Soifer et al (1979). The identities and natures of all of the 4.6 micrometers absorption components have been investigated by spectroscopy of samples prepared in the laboratory using instrumentation of the University of Leiden Laboratory Astrophysics Group. The result of an experiment is presented in which a CO-NH3 gaseous mixture, deposited onto a 10 K substrate, was subjected first to ultraviolet irradiation and then temperature cycling between 10 K and 150 K. The ultraviolet photolysis produces radicals in the frozen mixture which react with the remaining frozen CO and NH3 to produce new molecules. Heating of the mixture allows additional reactions and molecule formation to take place, to some extent simulating a long time interval in a molecular cloud. At the end of the experiment, molecules whose spectrum closely matched the entire 4.6 micrometers absorption spectrum of W33A were produced. B.W.

N84-26493# Preston Polytechnic (England). Div. of Physics and Astronomy.
OBSERVATIONS OF THE INTERSTELLAR ICE GRAIN FEATURE IN THE TAURUS MOLECULAR CLOUDS **c90**
C. B. Whittet, M. F. Bode (Los Alamos National Lab.), A. J. Longmore (United Kingdom Infrared Telescope Unit), D. W. T. Baines (Royal Observatory, Edinburgh), and A. Evans (Keele Univ.) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 61-69 refs Previously announced as N84-20453 (For primary document see N84-26485 16-88)
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Water ice was originally proposed as a major constituent of the interstellar grain population, the advent of infrared astronomy has shown that the expected absorption due to O-H stretching vibrations at 3 (SIGMA)m is illusive. It is revealed that the carrier of this feature is restricted to regions deep within dense molecular clouds. The exact carrier of this feature however is still controversial, and many questions remain as to the conditions required for its appearance. It is also uncertain whether it is restricted to circumstellar shells, rather than the general cloud medium. The 3 (SIGMA)m band properties are discussed. Author

N84-26494# Huygens Laboratium, Leiden (Netherlands). Lab. Astrophysics.
THE 3 MICRON ICE BAND **c90**
J. Mayo Greenberg and C. E. P. M. vandeBult *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 70-81 refs (For primary document see N84-26485 16-88)
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Ever since it was proposed by van de Hulst (1949) that H2O could be a dominant constituent of interstellar grains its detection, or lack thereof, has played a large role in theories of grains and their evolution. Since those early years of infrared exploration both observations and laboratory investigations have made it possible to begin to understand the ice band and to use it as a probe of cloud and dust evolution. The main outlines of a theory are presented which provides reasonable answers to a number of questions as well as giving useful directions for further investigations. This problem is approached from certain general considerations as well as by detailed comparisons with observations. B.W.

N84-26495# Huygens Laboratium, Leiden (Netherlands). Lab. Astrophysics.
EXPERIMENTS ON CHEMICAL AND PHYSICAL EVOLUTION OF INTERSTELLAR GRAIN MANTLES **c90**
J. Mayo Greenberg *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 82-92 refs (For primary document see N84-26485 16-88)
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In this experiment the essential conditions in interstellar space as they affect the evolution of interstellar grains are simulated. A schematic of the laboratory analog method for studying interstellar grain evolution is presented. B.W.

N84-26496# Kapteyn Astronomical Lab., Groningen (Netherlands).
SPECTROSCOPY OF THE 3.3 AND 3.4 MICRON DUST EMISSION FEATURES **c89**
T. R. Geballe *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 93-95 refs (For primary document see N84-26485 16-88)
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Unidentified infrared features which have been observed in the interstellar medium are thought to be emitted or absorbed by molecules within dust grains. In order to correctly identify these molecules, accurate high spectral resolution measurements of the features must be obtained. The 3.3 and 3.4 micron features were observed in the planetary nebula NGC 7027 and in the HII region S106 to obtain more accurate profiles. A highly precise peak wavelength and shape of the emission feature near the peak were not possible to attain because of telluric absorption lines. Although the two objects NGC 7027 and S106 represent opposite ends of the evolutionary spectrum, the shapes of the 3.3 and 3.4 micron features in these two objects are identical to within the uncertainties. R.S.F.

N84-26497# Space Telescope Science Inst., Baltimore, Md.
NEAR INFRARED OBSERVATIONS OF THE VISUAL REFLECTION NEBULAE NGC 7023, NGC 2023 AND NGC 2068 **c89**
K. Seligren *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 96-104 refs (For primary document see N84-26485 16-88)
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The infrared emission of nebulae NGC 7023, 2023, and 2068 has been found to consist not of reflected light, but rather to be due to some other emission process. Infrared emission consists of a smooth continuum which extends at least from 1.25 to 4.8 microns, with strong emission features at 3.3 and 3.4 microns. The continuum emission can be described by a greybody with a color temperature of approximately 1000 K. One hypothesis for the infrared continuum emission from visual reflection nebulae is thermal emission from small grains undergoing thermal fluctuation. Infrared spectra and surface brightness data generated from spectrophotometer and broadband photometer measurements are presented and discussed in light of existing hypotheses for reflection nebulae emission. R.S.F.

N84-26498# Edinburgh Univ. (Scotland). Dept. of Astronomy.
THE BEHAVIOUR OF THE 3.28 MICRON DUST FEATURE IN NGC 2024 **c90**
P. W. J. L. Brand, D. H. Beattie (United Kingdom Infrared Telescope Unit), Ian Gatley (United Kingdom Infrared Telescope Unit), P. J. Meadows, and R. D. Wolstencroft (Royal Observatory) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 105-112 refs (For primary document see N84-26485 16-88)
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Observations of the 3.28 micron unidentified dust emission feature and the hydrogen Brackett alpha line were made at several spatial positions across the ionization front in the HII region of NGC 2024, the second most prominent source in the Orion complex. The hydrogen observations delineate the edge of the ionized region, while the 3.3 micron feature was continouous across the front. The 3.4 micron feature was observed with a constant strength relative to the 3.28 micron feature of 0.3 + or - .01. Since the 3.28 micron feature was seen outside the ionized region, the dust necessarily is excited by non-ionizing ultra violet photons from the exciting star in the HII region. R.S.F.

N84-26499# Sterrewacht, Leiden (Netherlands).
THE 3.3 MICRON MAPPING OF NGC 7027 **c89**
Richard Isaacman *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 113-117 refs (For primary document see N84-26485 16-88)
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Among the principal unknowns regarding planetary nebulae is the nature of several unidentified infrared spectral lines, the best studied of which are the 3.3 and 11.3 micron lines. The bright planetary nebula NGC 7027 was mapped using an infrared telescope. The results of the mapping were used to assess the validity of three excitation mechanisms examined were: (1) thermal emission from small refractory grains, (2) thermal emission from voltatile mantles, and (3) ultraviolet fluorescence. R.S.F.

N84-26500# United Kingdom Infrared Telescope Unit, Hilo, Hawaii.
ORIGINS OF THE 3.28 MICRON DUST EMISSION FEATURE **c90**
Ian Gatley *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 118-127 refs (For primary document see N84-26485 16-88)
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Some practical problems encountered in making spectroscopic observations in the 3 to 4 micron wavelength range are discussed. Emphasis is placed on the interpretation of observations of the galactic center, and their implications for the origins of the 3.28 micron dust emission feature. These observations suggest, in contrast to some previous analyses, that the carrier of the 3.28 micron feature may be a common, non-volatile component of interstellar grains. Author

N84-26501# University of Electro-Communications, Tokyo (Japan). Lab. of Applied Science.
QUENCHED CARBONACEOUS COMPOSITE (QCC): A LIKELY CANDIDATE FOR INTERSTELLAR GRAINS **c90**
Akira Sakata, Setsuko Wada, Toshihiko Tanabe (Tokyo Univ.), and Takashi Onaka (Tokyo Univ.) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 128-136 refs (For primary document see N84-26485 16-88)
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A carbonaceous composite synthesized from hydrocarbon plasma shows an extinction property resembling the observed average interstellar extinction curve around the 220 nm hump. This composite is synthesized by quenching the excited gas ejecting from a plasma of methane gas, thus it is termed quenched carbonaceous composite or QCC. Quenched carbonaceous composite was investigated in the infrared region. It was found that QCC can account for some of the unidentified bands in the infrared region detected in several celestial objects. These features can be interpreted in terms of vibrational modes of adsorbed molecules, radicals and atoms, or surface functional groups of atoms which themselves constitute QCC. These results suggest that most of the pronounced features of the interstellar grains, such as the 220 nm hump and the infrared unidentified bands, originate from substances whose major constituent is carbon. The infrared spectrum of QCC are presented and interpretations of the features are given. A picture of QCC inferred from these data is also discussed. R.S.F.

N84-26502# Kyoto Univ. (Japan). Dept. of Physics.
FAR INFRARED EXTINCTION COEFFICIENTS OF MINERALS OF INTEREST FOR ASTRONOMICAL OBSERVATIONS **c89**
Hiroichi Hasegawa and Chiyoe Koike (Kyoto Coll. of Pharmacy) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 137-144 refs (For primary document see N84-26485 16-88)
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Far infrared extinction coefficients of mineral grains of interest of astronomical observations were measured. The measured mineral species are as follows; amorphous carbon; high temperature magnesium silicates; hydrous silicates; iron oxides; and amorphous silicates. The fine grains of some samples were made by the gas evaporation method or by burning. Most of the samples were prepared by the gas evaporation method or by burning. Most of the samples were prepared by grinding the minerals into fine grains with a size of less than 1 micron. The fine grains were mixed with polyethylene powder, and were hot rolled into sheets. The transmissions were measured by the far infrared grating spectrometer of Mitsuishi Laboratory of Osaka University. Author

N84-26503# Kyoto Univ. (Japan). Dept. of Physics.
ORIGIN OF AMORPHOUS INTERSTELLAR GRAINS **c90**
Hiroichi Hasegawa *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 144-152 refs (For primary document see N84-26485 16-88)
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The existence of amorphous interstellar grains was suggested from infrared observations. Some carbon stars show the far infrared emission with a 1/lambda wavelength dependence. Far infrared emissions supposed to be due to silicate grains often show the 1/lambda wavelength dependence. Mid infrared spectra around 10 microns have broad structure. These may be due to the amorphous silicate grains. The condition that the condensed grains from the cosmic gas are amorphous is discussed. A grain which just condensed from the supercooled gas through the nucleation and growth process is assumed to be of a random structure rather than an ordered lattice structure. In this grain a crystal nucleus, a locally regular arrangement of atoms, is produced. The growth of this nucleus will make the grain crystalline. A basic interstellar

dust model was used to derive a chemical and morphological picture of the comet nucleus material. Author

N84-26504# Kyoto Univ. (Japan).
NOVA AQUILAE 1982: THE NATURE OF ITS DUST c90
A. J. Longmore and P. M. Williams *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 153-157 refs (For primary document see N84-26485 16-88)
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Novae were long recognized as providing one of many mechanisms for the return of material from stars to the interstellar medium. It is unlikely that the nova stage itself plays a dominant role amongst these mechanisms, but it is still a force to be reckoned with. It is not surprising that along with the (typically) approximately 0.1 solar mass of gas released in the nova event, a much smaller mass of dust grains might be found. Infrared photometric measurements of novae have indeed found dust to be present. However, 1 to 20 micron observations of Nova Aquilae 1982 show that the conventional picture of dust forming in the nova ejecta does not apply in this case, and suggest a re-examination of the infrared modelling of earlier novae would be worthwhile. Author

N84-26505# Texas Univ., Austin. Dept. of Astronomy.
INFRARED POLARIMETRY OF YOUNG CLUSTERS c90
Harriet L. Dinerstein *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 158-161 refs (For primary document see N84-26485 16-88)
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Infrared polarimetry is a rapidly developing new technique with great promise for studying young stellar clusters and the dust in their vicinities. The high linear polarization of the BN source in the near-infrared was discovered about 15 years ago, and explained as selective extinction by cold grains aligned by a magnetic field. This is an extension to much larger column densities of the dichromic absorption mechanism responsible for the polarization of optical stellar light passing through the diffuse interstellar medium. Since then, many other point sources in molecular clouds were found to have relatively high polarizations in the near infrared. Some of the current directions in which infrared polarization studies are progressing include higher spatial resolution, more complete wavelength coverage, and higher spectral resolution work. Author

N84-26506# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NEW INFRARED OBSERVATIONS OF IRS1, IRS3 AND THE ADJACENT NEBULA IN THE OMC-2 CLUSTER c89
Y. Pendleton, M. W. Werner, R. Capps (Hawaii Univ.), and Harriet L. Dinerstein (Texas Univ., Austin) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 162-166 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

Near infrared reflection nebulae are often observed around embedded protostellar objects. New observations of the infrared cluster of low luminosity protostars in Orion Molecular Cloud 2 (OMC2) are reported. The asymmetric distribution of the extended emission seen about IRS1 is in fact another infrared reflection nebulae. Observations of near infrared polarimetry, photometry, and spectrophotometry were carried out. Author

N84-26507# Royal Observatory, Edinburgh (Scotland).
STRUCTURE IN THE INTERSTELLAR POLARIZATION CURVE AND THE NATURE OF THE POLARIZING GRAINS c90
Ramon D. Wolstencroft and Robert J. Smith (Marconi Space and Defence Systems) *In its* Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 167-170 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

The nature of the interstellar grains was examined by using infrared spectral features as the principal diagnostic. The structure recently found in the interstellar polarization curve is described and its relation to the structure seen in the extinction curve and the nature of the grains producing the spectral features are discussed. There is no universal agreement about the composition of the interstellar grains but it seems likely that there are a few main components each with a distinct composition: graphite, silicates, metal oxides and grains with complex organic mantles are most commonly considered. The average shape and magnetic susceptibility of these grain components, and hence their polarization efficiencies, are likely to differ. The amplitude of any spectral structure in the polarization will be greatest in those components with the greatest polarization efficiency. The measurement of the polarization curve is more straightforward in the sense that no comparison star is needed, but the high precision required means that long integrations are necessary. Author

N84-26508# Space Telescope Science Inst., Baltimore, Md.
THE NEAR INFRARED POLARIZATION OF NGC 7023 c89
K. Sellgren *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 171-172 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

NGC 7023 is a visual reflection nebula whose low optical depth at near infrared wavelengths suggests it may be well-suited to analysis of the near infrared scattering properties of dust. The near infrared emission of NGC 7023, however, was found to be dominated by a continuum emission in NGC 7023 is not known, although a model was proposed in which it is attributed to thermal emission from small (10 A radius) grains which are briefly heated to approximately 1000 K by the absorption of a UV photon. While processes other than scattered light dominate the near infrared emission of NGC 7023, a detectable scattered light component remains, as is demonstrated by polarization measurements. Author

N84-26509*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
APPLICATION OF A GLOBAL SOLAR WIND/PLANETARY OBSTACLE INTERACTION COMPUTATIONAL MODEL: EARTH, VENUS, MARS, JUPITER AND SATURN STUDIES Summary Report, Jun. 1983 - Jun. 1984
Stephen S. Stahara May 1984 169 p refs
(Contract NASw-3791)
(NASA-CR-173531; NAS 1.26:173531; NEAR-TR-322) Avail: NTIS HC A08/MF A01 CSCL 03B

The investigations undertaken in this report relate to studies of various solar wind interaction phenomena with Venus, Earth, Mars, Jupiter and Saturn. A computational model is developed for the determination of the detailed plasma and magnetic field properties associated with various planetary obstacles throughout the solar system. For individual titles, see N84-26510 through N84-26515.

N84-26510*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
APPLICATION OF A GLOBAL SOLAR WIND/PLANETARY OBSTACLE INTERACTION COMPUTATIONAL MODEL: EARTH, VENUS, MARS, JUPITER AND SATURN STUDIES c92
Stephen S. Stahara *In its* Appl. of a Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 11p refs (For primary document see N84-26509 16-88)
Avail: NTIS HC A08/MF A01 CSCL 03B

This work relates to a series of collaborative investigations involving the application of a computational model for the determination of the detailed plasma and magnetic field properties associated with the global interaction of the solar wind with various planetary obstacles throughout the solar system. The theoretical method is based on an established single fluid, steady, dissipationless, magnetohydrodynamic continuum model, and is appropriate for the calculation of supersonic, super-Alfvenic solar wind flow past planetary obstacles. The investigations undertaken relate to studies of various solar wind interaction phenomena with Venus, Earth, Jupiter, and Saturn. B.W.

N84-26511*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
PATTERNS OF MAGNETIC FIELD MERGING SITES ON THE MAGNETOPAUSE c46
J. G. Luhmann, R. J. Walker, C. T. Russell, N. U. Crooker, J. R. Spreiter (Stanford Univ.), and Stephen S. Stahara (Neilsen Eng. and Res., Inc.) *In* Neilsen Eng. and Res., Inc. Appl. of a Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 10p (For primary document see N84-26509 16-88)
Avail: NTIS HC A08/MF A01 CSCL 04A

Models of the magnetospheric and magnetosheath magnetic fields are used to determine the relative orientations of the two near the dayside magnetopause for the purpose of locating potential merging sites. Areas of the magnetopause with various degrees of antiparalleiness for different interplanetary fields as contour diagrams are studied. For southward and GSE-Y interplanetary field, the patterns obtained are consistent with those envisioned by Crooker in an earlier analysis which used simplified representations for the magnetic field geometry. Here the application of realistic models shows the locations of areas where any antiparallel component occurs. Merging sites for radial interplanetary fields are also illustrated. The results suggest that the geometrical configuration of the fields is suitable for merging over a large fraction of the magnetopause for interplanetary fields that are either primarily southward, GSE-Y, or radial (GSE-X) in direction. Author

N84-26512*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
CHARACTERISTICS OF THE MAGNETOSPHERIC SOURCE OF INTERPLANETARY ENERGETIC PARTICLES c93
J. G. Luhmann, R. J. Walker, C. T. Russell, N. U. Crooker, J. R. Spreiter (Stanford Univ.), Stephen S. Stahara (Neilsen Eng. and Res., Inc.), and D. J. Williams *In* Neilsen Eng. and Res., Inc. Appl. of A Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 18p Prepared in cooperation with California Univ., Los Angeles (For primary document see N84-26509 16-88)
Avail: NTIS HC A08/MF A01 CSCL 03B

The Earth's bow shock is frequently cited as an example of an astrophysical shock where particle acceleration is observed. However, because energetic particles observed upstream of the bow shock may be accelerated within the magnetosphere, it is important to understand the properties of the magnetospheric source. A first order picture of the spatial distribution of magnetospheric particles in the magnetosheath and upstream is obtained by mapping those magnetic field lines which drape over the magnetopause through the bow shock. Subsets of these field lines that connect to potential sites of magnetic merging on the magnetopause are also traced in the event that leakage occurs preferentially where normal components of the field are present across the boundary. The results can be used to determine whether the so-called diffuse particles observed upstream are accelerated locally or within the magnetosphere. Author

N84-26513*# California Univ., Los Angeles. Dept. of Atmospheric Sciences.
MAGNETOPAUSE MERGING SITE ASYMMETRIES c46
N. U. Crooker, J. G. Luhmann, J. R. Spreiter (Stanford Univ.), and Stephen S. Stahara (R. M. Assoc., Inc.) *In* Neilsen Eng. and Res., Inc. Appl. of A Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 23p refs (For primary document see N84-26509 16-88)
(Grants NsG-5351; NSF ATM-82-10691)
Avail: NTIS HC A08/MF A01 CSCL 04A

Regions where a draped model magnetosheath magnetic field is nearly antiparallel to a model geomagnetic field are shown to be asymmetric for an interplanetary magnetic field (IMF) at the garden hose angle, as suggested by Heelis. When the IMF has a southward component, the asymmetry favors the dawn region for both IMF polarities. The dusk region is favored when the IMF has a northward component. If the regions of antiparallel fields are assumed to be sites of maximum magnetic merging, then the asymmetry is consistent with observed seasonal variations of geomagnetic activity and with dawn-displaced magnetospheric phenomena. In the alternate merging geometry of a line passing through the subsolar region, the asymmetry is predominantly north-south rather than dawn-dusk. Merging line geometry is consistent with the seasonal variations but not with the dawn-displaced phenomena. B.W.

N84-26514*# California Univ., Los Angeles. Dept. of Atmospheric Sciences.
MAGNETIC FIELD DRAPING AGAINST THE DAYSIDE MAGNETOPAUSE c46
N. U. Crooker, J. G. Luhmann, C. T. Russell, E. J. Smith (JPL), J. R. Spreiter (Stanford Univ.), and Stephen S. Stahara (R. M. Assoc., Inc.) *In* Neilsen Eng. and Res., Inc. Appl. of A Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 18p refs (For primary document see N84-26509 16-88)
(Grants NsG-5351; NSF ATM-82-10691)
Avail: NTIS HC A08/MF A01 CSCL 04A

Interplanetary magnetic fields observed upstream of Earth's magnetosphere at ISEE 3 form input for a gasdynamic model of magnetic field draping in the dayside magnetosheath. Model results near the magnetopause are compared with appropriately lagged observations at ISEE 1. In 16 to 24 cases, the angle between the transverse component of the model and observed fields is less than 20 deg. The agreement is surprisingly good in view of the uncertainty introduced by the large distances between ISEE 1 and ISEE 3. The results indicate that magnetohydrodynamic and energy transfer processes at the magnetopause do not cause large distortions of the magnetosheath magnetic field. In addition, a comparison between observed and model field magnitudes indicates that immediately outside the magnetopause the observed field behaves like the model field at a distance of approx. 0.5 R sub E from the magnetopause, outside the region where magnetohydrodynamic effects make the gasdynamic model inapplicable. Patterns of model magnetic field orientation at the magnetopause are presented for practical application. Author

N84-26515*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
THE MAGNETIC FIELD OF MARS: IMPLICATIONS FROM GASDYNAMICS MODELING c93
C. T. Russell, J. G. Luhmann, J. R. Spreiter (Stanford Univ.), and Stephen S. Stahara (R.M. Assoc.) *In* Neilsen Eng. and Res., Inc. Appl. of A Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 24p refs (For primary document see N84-26509 16-88)
(Grants NAGw-278; NSF ATM-82-10691)
Avail: NTIS HC A08/MF A01 CSCL 03B

On January 21, 1972 the Mars-3 spacecraft observed a variation in the magnetic field during its periapsis passage over the dayside of Mars that was suggestive of entry into a Martian magnetosphere. The original data and trajectory have been obtained to simulate the observed variation of the magnetic field using gasdynamics. In the gasdynamic model, a flow field is first generated and then this flowfield is used to carry the interplanetary magnetic field through the Martian magnetosheath. The independence of the flow field and magnetic field calculation allows rapid convergence on an IMF orientation which would result in a magnetic variation similar to that observed by Mar-3. There appears to be no need to invoke an entry into a Martian magnetosphere to explain these observations. B.W.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-26516# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
BRAZIL NATIONAL REPORT ON RADIO ASTRONOMY (1981 -

1984)
Pierre Kaufmann Apr. 1984 11 p refs To be presented at the 21st General Assembly on Radio Astronomy, Firenze, Italy, 28 Aug. - 5 Sep. 1984
(INPE-3052-PRE/473) Avail: NTIS HC A02/MF A01

Radio astronomy research in Brazil is reviewed. An acousto-optics radio spectrometer and a radio telescope are discussed, along with their application in solar radio astronomy, extragalactic radio astronomy, galactic studies, and comet observation. Among the specific phenomena studied were interstellar masers, solar radio bursts, solar cycles, and the Magellanic clouds. R.S.F.

N84-26517*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SEEING HALLEY'S COMET: A GUIDE FOR OBSERVERS IN THE NORTHERN HEMISPHERE
May 1983 4 p refs
(NASA-CR-173604; JPL-400-189; NAS 1.26:173604) Avail: NTIS HC A02/MF A01 CSCL 03A

A guide for the observation of Halley's comet is presented. The path of the comet is described for the fly by dates and charts are provided for location of the comet in the morning or evening skies. Suggestions for visual observation and photography of Halley's comet are included. M.A.C.

N84-26518*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NEUTRAL CARBON IN THE EGG NEBULA (AFGL 2688)
C. A. Beichman, Jocelyn Keene, T. G. Phillips (California Inst. of Technology), P. J. Huggins (NYU), H. A. Wooten (California Inst. of Technology), C. Masson (California Inst. of Technology), and M. A. Frerking Apr. 1983 27 p refs Previously announced as A84-12219
(NASA-TM-84360; A-9322; NAS 1.15:84360) Avail: NTIS HC A03/MF A01 CSCL 03A

A search for sub-mm C I emission from seven stars that are surrounded by dense molecular gas shells led to the detection, in the case of the 'Egg Nebula' (AFGL 2688), of an 0.9 K line implying a C I/CO value greater than 5. The material surrounding this star must be extremely carbon-rich, and it is suggested that the apparently greater extent of the C I emission region may be due to the effects of the galactic UV field on the shell's chemistry, as suggested by Huggins and Glassgold (1982). R.J.F.

N84-26519*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FAR INFRARED SUPPLEMENT: CATALOG OF INFRARED OBSERVATIONS
Daniel Y. Gezari, Marion Schmitz (Computer Sciences Corp.), and Jaylee M. Mead May 1984 97 p
(Contract NAS5-24350)
(NASA-RP-1119; NAS 1.61:1119) Avail: NTIS HC A05/MF A01 CSCL 03A

The Far Infrared Supplement: catalog of infrared observations summarizes all infrared astronomical observations at far infrared wavelengths published in the scientific literature between 1965 and 1982. The Supplement list contains 25% of the observations in the full catalog of infrared observations (C10), and essentially eliminates most visible stars from the listings. The Supplement is more compact than the main Catalog (it does not contain the bibliography and position index of the C10), and is intended for easy reference during astronomical observations. E.A.K.

N84-26520*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CATALOG OF INFRARED OBSERVATIONS INCLUDING: BIBLIOGRAPHY OF INFRARED ASTRONOMY AND INDEX OF INFRARED SOURCE POSITIONS
Daniel Y. Gezari, Marion Schmitz (Computer Sciences Corp.), and Jaylee M. Mead May 1984 563 p
(NASA-RP-1118; NAS 1.61:1118) Avail: NTIS HC A24/MF A01 CSCL 03A

The Catalog of Infrared Observations and its Far Infrared Supplement summarize all infrared astronomical observations at infrared wavelengths published in the scientific literature between 1965 and 1982. The Catalog includes as appendices the Bibliography of infrared astronomy which keys observations in the Catalog with the original journal references, and the index of infrared source positions which gives source positions for alphabetically listed sources in the Catalog. The Catalog data base contains over 85,000 observations of about 10,000 infrared sources, of which about 2,000 have no known visible counterpart. E.A.K.

N84-26521*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FAR-IR SELECTED STAR FORMATION REGIONS
D. T. Jaffe (Chicago Univ.), R. H. Hildebrand (Chicago Univ.), Jocelyn Keene (Chicago Univ.), D. A. Harper (Chicago Univ.), R. F. Loewenstein (Chicago Univ.), and J. M. Moran (Harvard-Smithsonian Center for Astrophysics) May 1984 28 p refs
(NASA-TM-85955; A-9765; NAS 1.15:85955) Avail: NTIS HC A03/MF A01 CSCL 03A

Detailed far-IR observations and complemenary submillimeter, 5 GHz continuum and c(18)0 observations of a sample of far-IR selected luminous regions of star formation. The clouds and that the exciting stars lie deep within these condensations. The far-IR sources have diversely shaped 40 micron to 180 micron spectra even through their 60 micron to 100 micron color temperatures are similar. The radio and far-IR results together show that the exciting stars are in clusters containing either zero-age main sequence and pre-main sequence stars or consisting entirely of premain sequence objects. C(18)0 and submillimeter observations imply gas densities approximately .00005 - high enough to make t(sub dust) approximately t(sub gas). Author

N84-26522*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
183 GHz WATER LINE VARIATION: AN ENERGETIC OUTBURST IN ORION KL Preprint Series 015
T. B. H. Kuiper (JPL), E. N. Rodriguez Kuiper (JPL), P. N. Swanson (JPL), Dale F. Dickinson (JPL), M. J. Klein (JPL), and P. Zimmermann (JPL) May 1984 47 p refs Submitted for publication
(NASA-TM-85956; A-9766; NAS 1.15:85956) Avail: NTIS HC A03/MF A01 CSCL 03A

Observations of the 3(13)-2(20) transition of water vapor in the direction of Ori MC1 in 1980 February show a 50% flux increase and an apparent additional red shift of approximately 2 km/s relative to the line observed in 1977 December. From a detailed examination of the amplitude and frequency calibration, it appears unlikely that the effect is due to systematic error. The increase is attributed to the appearance of a new component at a velocity of 12 km/s with respect to the local standard of rest. The new component also has broad wings. Increased emission from a region in the high-velocity core of Ori MC1 can be due either to additional far-IR radiation to pump the 1983 GHz transition or to a change in the physical conditions in the gas. Statistical equilibrium calculations using the large-velocity-gradient formalism were carried out to develop a model for the emission. The calculations support a model in which the gas in the region of enhanced emission is hotter than the dust. The temporal coincidence between the 183 GHZ increase and the 22 GH1 water maser outburst suggests a common, impulsive cause, which has heated the gas in a part of the HV source, enhancing the emission in both transitions. M.G.

N84-26523*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DETECTION OF SHOCKED ATOMIC GAS IN THE KLEINMANN-LOW NEBULA Preprint Series 016
M. W. Werner, M. K. Crawford (California Univ., Berkeley), R. Genzel (California Univ., Berkeley), D. J. Hollenback, C. H. Townes (California Inst. of Tech., Pasadena), and F. M. Watson (California Inst. of Tech., Pasadena) May 1984 15 p refs
(Grant NAG2-208)
(NASA-TM-85967; A-9774; NAS 1.15:85967) Avail: NTIS HC A02/MF A01 CSCL 03A

The 63 micrometer (3)p(1)-(3)P(2) fine structure line emission

of neutral atomic oxygen at the center of the Orion nebula with a resolution of 30' is presented. There are three main emission peaks. One is associated with the region of strongest thermal radio continuum radiation close to the Trapezium cluster, and probably arises at the interface between the HII region and the dense Orion molecular cloud. The other two line emission peaks, associated with the Kleinmann Low nebula, are similar in both distribution and velocity to those of the 2 micrometer S(1) line of molecular hydrogen and of the high velocity wings of rotational CO emission. The [OI] emission from the KL nebula can be produced in the shocked gas associated with the mass outflows in this region and is an important coolant of the shocked gas.
M.A.C.

N84-26524*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NGC 2024: FAR-INFRARED AND RADIO MOLECULAR OBSERVATIONS Preprint Series 013
Harley A. Thronson, Jr. (Wyoming Univ.), Charles J. Lada (Arizona Univ., Tucson), P. R. Schwartz (NRL, Washington, D.C.), Howard A. Smith (NRL, Washington, D.C.), J. Smith (Wyoming Univ.), W. Glaccum (Yerkes Observatory), D. A. Harper (Yerkes Observatory), and R. F. Loewenstein (Yerkes Observatory) May 1984 43 p refs Submitted for publication
(NASA-TM-85954; A-9764; NAS 1.15:85954) Avail: NTIS HC A03/MF A01 CSCL 03A

Far infrared continuum and millimeter wave molecular observations are presented for the infrared and radio source NGC 2024. The measurements are obtained at relatively high angular resolution, enabling a description of the source energetics and mass distribution in greater detail than previously reported. The object appears to be dominated by a dense ridge of material, extended in the north/south direction and centered on the dark lane that is seen in visual photographs. Maps of the source using the high density molecules CS and HCN confirm this picture and allow a description of the core structure and molecular abundances. The radio molecular and infrared observations support the idea that an important exciting star in NGC 2024 has yet to be identified and is centered on the dense ridge about 1' south of the bright mid infrared source IRS 2. The data presented here allows a presentation of a model for the source. M.A.C.

N84-26525*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE ENERGETICS AND MASS STRUCTURE OF REGIONS OF STAR FORMATION
Harley A. Thronson, Jr. (Wyoming Univ., Laramie), Howard A. Smith (NRL, Washington, D.C.), Charles J. Lada (Arizona Univ., Tucson), W. Glaccum (Chicago Univ., Williams Bay, Wis.), D. A. Harper (Chicago Univ., Williams Bay, Wis.), R. F. Loewenstein (Chicago Univ., Williams Bay, Wis.), and J. Smith (Chicago Univ., Williams Bay, Wis.) May 1984 35 p refs Previously announced in IAA as A84-29414
(Grant NAG2-134)
(NASA-TM-85953; A-9738; NAS 1.15:85953) Avail: NTIS HC A03/MF A01 CSCL 03A

Theoretical predictions about dust and gas in star forming regions are tested by observing a 4 arcmin region surrounding the radio continuum source in 5201. The object was mapped in two far infrared wavelengths and found to show significant extended emission. Under the assumption that the molecular gas is heated solely via thermal coupling with the dust, the volume density was mapped in 5201. The ratios of infrared optical depth to CO column density were calculated for a number of positions in the source. Near the center of the cloud the values are found to be in good agreement with other determinations for regions with lower column density. In addition, the observations suggest significant molecular destruction in the outer parts of the object. Current models of gas heating were used to calculate a strong limit for the radius of the far infrared emitting grains, equal to or less than 0.15 micron. Grains of about this size are required by the observation of high temperature (T equal to or greater than 20 K) gas in many sources. Author(IAA)

N84-26526*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE NATURE OF AFGL 2591 AND ITS ASSOCIATED MOLECULAR OUTFLOW: INFRARED AND MILLIMETER-WAVE OBSERVATIONS Preprint Series 018
Charles J. Lada (Arizona Univ., Tucson), Harvey A. Thronson, Jr. (Wyoming Univ.), Howard A. Smith (NRL, Washington, D.C.), P. R. Schwartz (NRL, Washington, D.C.), and W. Glaccum (Yerkes Observatory) May 1984 40 p refs Submitted for publication
(NASA-TM-85963; A-9757; NAS 1.15:85963) Avail: NTIS HC A03/MF A01 CSCL 03A

The results of infrared photometry from 2 to 160 microns of AFGL and CO(12) observations of its associated molecular cloud and high velocity molecular outflow are presented and discussed. The observed solar luminosity is 6.7 x 10(4) at a distance of 2 kpc. The spectrum of AFGL 2591 is interpreted in the context of a model in which a single embedded object is the dominant source of the infrared luminosity. This object is determined to be surrounded by a compact, optically thick dust shell with a temperature in excess of several hundred degrees kelvin. The extinction to this source is estimated to be between 26 and 50 visual magnitudes. The absolute position of the infrared sources at 10 microns was determined to an accuracy of + or in. This indicates for the first time that the IR source and H2O source are not coincident. The CO(12) observations show the high-velocity molecular flow near AFGL 2591 to be extended, bipolar and roughly centered on the infrared emission. The observations suggest that the red-shifted flow component extends beyond the boundary of the ambient cloud within which AFGL 2591 is embedded. The CO(12) observations also show that AFGL 2591 is embedded in a molecular cloud with an LSR velocity of -5 km/s. M.G.

N84-26527*# University of Southern California, Los Angeles. Dept. of Astronomy.
A SEARCH VARIABILITY IN THE UV SPECTRUM OF PI AQUARII AND Fe 3 SHELL LINES OF BE STARS Final Report
22 Jun. 1984 8 p refs
(Grant NAG5-126)
(NASA-CR-173611; NAS 1.26:173611) Avail: NTIS HC A02/MF A01 CSCL 03A

Several short U1 and U2 observations of Be stars are obtained with the Copernicus satellite. Pi Aquarii (B1 IV-Ve) is observed with the U1 and U2 spectrometers. These scans are compared with earlier observations. Variations in the strengths and profiles of selected shell and photospheric features are examined. In order to study possible changes in the temperature of the circumstellar envelope, features covering a wide range in ionization are observed. Included in the observing program are lines of O VI, N V, Si IV, Si III, S III, Fe III, and N I. M.A.C.

N84-26528*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
OBSERVATIONAL AND THEORETICAL STUDIES OF RICH CLUSTERS WITH MULTIPLE SUBCONDENSATIONS Semiannual Report, 1 Jan. - 30 Jun. 1984
Margaret J. Geller and John P. Huchra Jun. 1984 11 p
(Grant NAGw-201)
(NASA-CR-173618; NAS 1.26:173618; SAR-6) Avail: NTIS HC A02/MF A01 CSCL 03A

Observational and theoretical studies of the formation and evolution of clusters of galaxies are investigated. The relationship between the properties of individual galaxies and their environment is examined. Perphaps the most remarkable physical result derived from these is the apparent substructure in redishift position space. The distribution of spiral galaxies is quite different from the distribution of the ellipticals. The velocity distribution for the spirals is also substantially broader than the distribution for the ellipticals.
M.A.C.

N84-26529*# Breault Research Organization, Tucson, Ariz.
STRAY LIGHT ANALYSIS OF THE DIFFUSE INFRARED BACKGROUND EXPERIMENT (DIRBE)
Robert P. Breault 23 Mar. 1984 71 p refs

(Contract NAS5-27274)
(NASA-CR-175225; NAS 1.26:175225) Avail: NTIS HC A04/MF A01 CSCL 03A

The straylight analysis of the diffuse infrared background experiment (DIRBE) on the cosmic background explorer (COBE) mission is discussed. From the statement of work (SOW), the purpose of DIRBE is to measure, or set upper limits on, the spectral and spatial character of the diffuse extra galactic infrared radiation. Diffuse infrared sources within our own galaxy are measured. The required reduction of the unwanted radiation imposes severe design and operating restrictions on the DIRBE instrument. To accomplish its missions, it will operate at a multitude of wavelengths ranging from 1.25 um out to 200 to 300 microns. The operating bands and the required point source normalized irradiance transmittance (PSNIT) are shown. The important straylight concepts in the DIRBE design are reviewed. The model and assumptions used in APART analysis are explained. The limitations due to the scalar theory used in the analysis are outlined. E.A.K.

N84-26530*# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
RADAR INVESTIGATION OF ASTEROIDS Semiannual Status Report, 1 Jan. - 30 Jun. 1984
Steven J. Ostro Jul. 1984 16 p refs
(Grant NAGw-116)
(NASA-CR-173603; NAS 1.26:173603) Avail: NTIS HC A02/MF A01 CSCL 03A

The initial radar observations of the mainbelt asteroids 9 Metis, 27 Euterpe, and 60 Echo are examined. For each target, data are taken simultaneously in the same sense of circular polarization as transmitted as well as in the opposite (OC) sense. Estimates of the radar cross sections provide estimates of the circular polarization ratio, and the normalized OC radar cross section. The circular polarization ratio, is comparable to values measured for other large S type asteroids and for a few much smaller, Earth approaching objects, most of the echo is due to single reflection backscattering from smooth surface elements. M.A.C.

N84-26531# European Space Agency, Paris (France).
IUE LOW DISPERSION SPECTRA REFERENCE ATLAS. PART 1: NORMAL STARS
A. Heck, ed., D. Egret (Observatoire Astronomique, Strasbourg), M. Jaschek (Observatoire Astronomique, Strasbourg), C. Jaschek (Observatoire Astronomique, Strasbourg), and Bruce Battrick Feb. 1984 500 p refs
(ESA-SP-1052-Pt-1; ISSN-0379-6566) Avail: NTIS HC A21/MF A01

Reference sequences are presented with UV low dispersion spectra of standard stars exhibiting normal behavior in the UV range. The spectra were retrieved from the IUE data base and processed through the standard image processing software. A synoptic table lists the HD/BD numbers of the 229 stars in the atlas, together with their IUE classification. Flux tables and corresponding composite graphs are given for the full IUE range. The graphs have 2 A stages and the linear wavelength scale was chosen such that 100 A = 1 cm. Adjacent to the graphs are identification of the IUE images used, as well as basic astronomical data retrieved from the SIMBAD data base. Coordinates are given for the 1950.0 equinox. A set of 34 transparancies is provided for the most representative stars to allow direct comparison with the spectra and easy illustration of the spectral sequences. A.R.H.

N84-26532# New Mexico Univ., Albuquerque.
A HIGH DISPERSION SPECTRAL ANALYSIS OF THREE PRE-MAIN SEQUENCE STARS Ph.D. Thesis
Roger Eugene Davis 1983 293 p
Avail: Univ. Microfilms Order No. DA8404285

High dispersion image-tube echelle spectra, covering the range 400 a < wavelength < 6750A; are used to study the photospheric and envelope properties of three pre-main sequence stars. Techniques for the processing and analysis of the wealth of spectral information recorded by echellograms are presented and evaluated. The star HK Orionis reveals a complex spectrum which shows a distinct change in spectral type with wavelength. Supplementing the echelle information with photoelectric scanner observations of the spectral energy distribution. HK Orionis is shown to be a multiple component system. A definitive interpretation is elusive, but the observational evidence favors a star plus accretion disk scenario. The early K to middle K red classification of BM Andromedae are not confirmed. BM Andromedae displays an early G spectrum through the red and blue regions, agreeing with Walker's classification made from blue spectral information. However, support for duplicity is found in the radial velocity determinations of this star. Dissert. Abstr.

N84-26533# Arizona State Univ., Tempe.
THE EMISSION LINE SPECTRA OF CATACLYSMIC VARIABLE ACCRETION DISKS Ph.D. Thesis
Donald Harold Ferguson 1983 211 p
Avail: Univ. Microfilms Order No. DA8404666

An explanation of the emission line behavior in cataclysmic variables was among the most important and elusive problems in eruptive star research. Accretion disk chromosphere models of line emission to predict line behavior qualitatively are presented. A search for UX UMa like thick disk cataclysmics in the Palomar Green survey sample gave space densities consistent only with luminous high accretion rate disks. These typically were early K dwarfs paired with 30,000K subdwarf O stars. A substantial fraction of subdwarf O and B stars are binary. The detached eclipsing binary BE UMa showed a reflection effect emission line spectrum due to the close separation between an EUV emitting subdwarf O star and an M1-5 dwarf. The BE UMa optical emission line spectrum was modeled using a quantitative photoionization recombination stellar atmosphere like code. Dissert. Abstr.

N84-26534# Johns Hopkins Univ., Baltimore, Md.
THE DIFFUSE ULTRAVIOLET BACKGROUND: 1700 - 2900 ANGSTROMS Ph.D. Thesis
Peter Donald Tennyson 1984 164 p
Avail: Univ. Microfilms Order No. DA8403134

Diffuse Ultraviolet Light in the wavelength range of 1700 to 2900 Angstroms was observed from an Aries sounding rocket to an attitude of 265 km. The components of this light were spectroscopically analyzed. The predominant features in the spectrum are identified as airglow, zodiacal light and diffuse cosmic ultraviolet background light. Calibration of the instrument is discussed with comparison of the preflight and the postflight values. A discussion and interpretation of possible discrepancies is given. These are discussed in terms of both laboratory data and inflight measurements. The format of the raw data and possible noise contamination are discussed. Several possible sources of noise are given. A statistical filter for noise removal is given and a brief discussion of Poisson statistics is given in this context. Conversions from raw counts to units and Rayleighs are given for the instrument used for the observation. Dissert. Abstr.

N84-26492# Kapteyn Astronomical Lab., Groningen (Netherlands).
SPECTROSCOPY OF THE 4.6 - 4.7 MICRON INTERSTELLAR ABSORPTION FEATURES
T. R. Geballe *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 56-60 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26496# Kapteyn Astronomical Lab., Groningen (Netherlands).
SPECTROSCOPY OF THE 3.3 AND 3.4 MICRON DUST EMISSION FEATURES
T. R. Geballe *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 93-95 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26497# Space Telescope Science Inst., Baltimore, Md.
NEAR INFRARED OBSERVATIONS OF THE VISUAL REFLECTION NEBULAE NGC 7023, NGC 2023 AND NGC 2068
K. Sellgren *In* Royal Observatory Proc. of the Workshop on Lab.

and Observational Infrared Spectra of Interstellar Dust 1984 p 96-104 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26499# Sterrewacht, Leiden (Netherlands).
THE 3.3 MICRON MAPPING OF NGC 7027
Richard Isaacman *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 113-117 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26502# Kyoto Univ. (Japan). Dept. of Physics.
FAR INFRARED EXTINCTION COEFFICIENTS OF MINERALS OF INTEREST FOR ASTRONOMICAL OBSERVATIONS
Hiroichi Hasegawa and Chiyoe Koike (Kyoto Coll. of Pharmacy) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 137-144 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26506# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NEW INFRARED OBSERVATIONS OF IRS1, IRS3 AND THE ADJACENT NEBULA IN THE OMC-2 CLUSTER
Y. Pendleton, M. W. Werner, R. Capps (Hawaii Univ.), and Harriet L. Dinerstein (Texas Univ., Austin) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 162-166 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26508# Space Telescope Science Inst., Baltimore, Md.
THE NEAR INFRARED POLARIZATION OF NGC 7023
K. Sellgren *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 171-172 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N84-26535*# Rice Univ., Houston, Tex. Dept. of Space Physics and Astronomy.
SELF-REGULATING GALAXY FORMATION. PART 1: HII DISK AND LYMAN ALPHA PRESSURE
Donald P. Cox [1983] 79 p refs
(Grant NGL-50-002-044)
(NASA-CR-173592; NAS 1.26:173592) Avail: NTIS HC A05/MF A01 CSCL 03B

Assuming a simple but physically based prototype for behavior of interstellar material during formation of a disk galaxy, coupled with the lowest order description of infall, a scenario is developed for self-regulated disk galaxy formation. Radiation pressure, particularly that of Lyman depha (from fluorescence conversion Lyman continuum), is an essential component, maintaining an inflated disk and stopping infall when only a small fraction of the overall perturbation has joined the disk. The resulting galaxies consist of a two dimensional family whose typical scales and surface density are expressable in terms of fundamental constants. The model leads naturally to galaxies with a rich circumgalactic environment and flat rotation curves (but is weak in its analysis of the subsequent evolution of halo material). B.W.

N84-26536*# Princeton Univ., N. J. Dept. of Astrophysical Sciences.
RESEARCH IN EXTRAGALACTIC ASTROPHYSICS Final Report
Neta Bahcall Jun. 1984 3 p refs
(Grant NsG-7256)
(NASA-CR-173608; NAS 1.26:173608) Avail: NTIS HC A02/MF A01 CSCL 03B

The spatial distribution of clusters of galaxies and the large scale structure of the universe is investigated. Correlations in the spatial cluster distribution are much stronger than those seen for galaxies, and over scales much larger than previously anticipated. The following main studies are completed and published; (1) The determination of the correlation functions of rich clusters of galaxies, and its dependence on richness and other parameters. Very large scale structure exists in the universe, and rich clusters participate in this structure more efficiently than galaxies. (2) A complete catalog of superclusters, is determined. The selection criteria is that of a volume density enhancement, and is done in 3 dimensions. (3) The giant galaxy void in Bootes is found to be surrouned by rich, large superclusters from the catalog described above. (4) A very large scale void of rich clusters of galaxies is found in the study of the spatial distribution of rich clusters.M.A.C.

N84-26537*# Princeton Univ., N. J. Dept. of Astrophysical Sciences.
V-V COMPACT GROUP OF GALAXIES Final Report
Neta Bahcall Jun. 1984 16 p refs
(Grant NAG8-363)
(NASA-CR-173609; NAS 1.26:173609) Avail: NTIS HC A02/MF A01 CSCL 03A

A search for X-ray emission from five compact groups of galaxies with the Einstein Observatory revealed detections from three groups. Soft, extended X-ray emission was observed in Stephan's Quintet which is most likely caused by hot intracluster gas. This provides evidence for dynamical interaction among the group galaxies. X-ray emission from the group Arp 330 may also originate in hot intracluster gas. Stephan's Quintet and Arp 330 have the largest velocity dispersions among the groups studied suggesting a correlation between high velocity and the release (or properties) of hot gas. X-ray emission from Arp 318 may originate in its member galaxies. Author

N84-26538# Northwestern Univ., Evanston, Ill.
NUMERICAL RADIATIVE TRANSFER IN Be DISKS Ph.D. Thesis
Deborah Anne Brown 1983 91 p
Avail: Univ. Microfilms Order No. DA8403392

The ionization structure of a gaseous disk rotating around a central Be star in circular, Keplerian orbits is computed, and the profiles of emission lines from the disk studied. Three cases are considered, each modeled on the observations of the shell star 48 Librae, but having three distinct density distributions and two types of disk geometry. To handle the problem of velocity coupling in the disk, a step-by-step procedure for solving detailed equations of statistical equilibrium is developed that requires iteration between the radiation field and the hydrogen energy level densities. It is found that ionization occurs from all levels of the hydrogen atom, but especially from the second and third principal levels, and that the disk is not opaque to Balmer and Paschen continua. In addition, emission line profiles from the disk are sensitive to the disk geometry, but not the density distribution. Dissert. Abstr.

N84-26539# Washington Univ., Seattle.
CHEMICAL ABUNDANCES IN OLD OPEN AND METAL-RICH GLOBULAR CLUSTERS IN THE GALAXY Ph.D. Thesis
Douglas Paul Geisler 1983 237 p
Avail: Univ. Microfilms Order No. DA8404907

Abundances were determined for a number of open and globular clusters in the Galaxy from Washington photometry and echelle spectroscopy. A (MgI(b) + MgH) filter was added to the Washington system to discriminate between cluster giants and foreground dwarfs. Additional membership information was obtained from medium and high resolution spectra. After eliminating nonmembers, the mean cluster Washington metallicity agrees with the echelle (Fe/H) to within + or 0.3 dex. Combining the metallicity determinations, three classical metal-rich globulars - NGC 6352, M 69, and M71 - have (Fe/H) < - 1, confirming the new metallicity scale. Three other globulars - NGC 362, M4, and NGC 6723 -

have very similar (Fe/H) values. No globular clusters studied with Washington photometry or echelle spectroscopy have (Fe/H) values > -1. Several old open clusters - including NGC 2141, 2158, 2506, and Melotte 66 - have (Fe/H) values that lie within the range-0.65 to - 1.2, Thus the metallicities of the most metal-poor open clusters overlap with those of the metal-rich globulars.
Dissert. Abstr.

N84-26540# California Inst. of Tech., Pasadena.
BLACK-HOLE ELECTRODYNAMICS Ph.D. Thesis
Douglas Alan Macdonald 1984 231 p
Avail: Univ. Microfilms Order No. DA8404512

Several aspects of the structure and dynamics of electromagnetic fields around black holes are discussed. The four dimensional covariant laws of electrodynamics are reformulated in a 3 + 1 (space + time) language in which the key quantities are three-dimensional vectors lying in hypersurfaces of a constant global time t. This formulation is applied to the Blandford-Znajek model of power generation in quasars. The Blandford-Znajek quasar model is reformulated in terms of a dc circuit-theory analysis, and action principles describing the overall structure of the magnetosphere and the field distribution on the horizon are developed. A general prescription for constructing global models of force-free magnetospheres is developed and this prescription is used to generate numerical models of black-hole magnetospheres for a variety of field configurations and black-hole angular velocities. The electromagnetic boundary conditions at the horizon of a black hole are described in terms of a recently developed membrane viewpoint. The necessity and efficacy of using a stretched horizon in the membrane viewpoint is discussed. Dissert. Abstr.

N84-26541# Wisconsin Univ., Madison.
DETERMINATION OF NEBULAR TEMPERATURE AND DENSITY FROM RADIO RECOMBINATION LINES Ph.D. Thesis
Nils Peter Odegard 1983 71 p
Avail: Univ. Microfilms Order No. DA8325539

A new method is described for determining mean values of nebular electron temperature T sub e and local electron density N sub e from observations of two Hn alpha lines that are well separated in frequency, together with radio continuum observations. If the distance to the nebula is known, the filling factor and mass of the ionized gas can also be obtained. Values of T sub e and N sub e are derived by using a homogeneous, isothermal model to fit the observations. The weighting of the mean electron density derived in this way for an inhomogeneous nebula is determined by considering the effects of small-scale density fluctuations. The weighting of the mean electron temperature derived using an isothermal model has been given by Peimbert (1967). The reliability of the method of analysis is demonstrated by applying it to the calculated emission from various inhomogeneous model nebulae with large variations in density both along and across the line of sight. Dissert. Abstr.

N84-26542# Virginia Univ., Charlottesville.
TIDAL EFFECTS AND GLOBULAR CLUSTERS Ph.D. Thesis
Patrick Osborne Seitzer 1983 108 p
Avail: Univ. Microfilms Order No. DA8402872

Numerical experiments were conducted to explore how a globular cluster is tidally limited by the galaxy. The results show that the observed tidal radius is close to that predicted by simple dynamical arguments. The tidal cutoff is primarily a function of energy, supporting the use of an energy cutoff of a Maxwellian to build cluster models. The time scale for tidal relaxation of the particle distribution in the outer cluster halo is on the order of 50 to 100 orbital periods. To compare the above results with reality, a large search identified 22 new members of the globular cluster Omega Centauri. All are located further than one half the tidal radius from the cluster center. Accurate radial velocities plus or minus velocities (plus or minus 1 km/sec) were obtained, and the run of velocity dispersion with radius determined. Observed tidal radii of galactic globular clusters were analyzed to estimate the distribution of orbital eccentricities. The majority of clusters are on orbits with e greater than 0.5. A correlation was found between e and (Fe/H): the metal poorest clusters are on the least eccentric orbits. Dissert. Abstr.

N84-25891*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Section.
SUBMILLIARCSECOND VLBI OBSERVATIONS OF THE CLOSE PAIR GC 1342+662 AND GC 1342+663
D. D. Morabito *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 12-18 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 03B

N84-26486# Huygens Laboratium, Leiden (Netherlands). Lab. Astrophysics.
EVOLUTION OF INTERSTELLAR GRAINS
J. Mayo Greenberg *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 1-25 refs (For primary document see N84-26485 16-88)
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N84-26487# Colorado Univ., Boulder.
GRAIN DESTRUCTION IN INTERSTELLAR SHOCKS
C. Gregory Seab and J. Michael Shull (Colorado Univ.) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 26-32 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26488# Texas Univ., Austin. Dept. of Astronomy.
ON SUPERNOVAE AS A SOURCE OF INTERSTELLAR DUST: THE CURRENT OBSERVATIONAL PICTURE
Harriet L. Dinerstein *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 33-35 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26489# Kyoto Univ. (Japan). Dept. of Physics.
GRAIN FORMATION IN THE EXPANDING GAS FLOW AROUND COOL LUMINOUS STARS
Hiroichi Hasegawa *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 36-40 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26490*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE COMPOSITION OF INTERSTELLAR GRAIN MANTLES
A. G. G. M. Tielens *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 41-48 refs (For primary document see N84-26485 16-88)
Avail: NTIS HC A09/MF A01

N84-26491# Kyoto Univ. (Japan). Dept. of Physics.
HETEROGENEOUS CONDENSATION OF ICE MANTLE AROUND SILICATE CORE GRAIN IN MOLECULAR CLOUD
Hiroichi Hasegawa *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 49-55 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26493# Preston Polytechnic (England). Div. of Physics and Astronomy.
OBSERVATIONS OF THE INTERSTELLAR ICE GRAIN FEATURE IN THE TAURUS MOLECULAR CLOUDS
C. B. Whittet, M. F. Bode (Los Alamos National Lab.), A. J. Longmore (United Kingdom Infrared Telescope Unit), D. W. T. Baines (Royal Observatory, Edinburgh), and A. Evans (Keele Univ.) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 61-69 refs Previously announced as N84-20453 (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26494# Huygens Laboratium, Leiden (Netherlands). Lab. Astrophysics.
THE 3 MICRON ICE BAND
J. Mayo Greenberg and C. E. P. M. vandeBult *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 70-81 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26495# Huygens Laboratium, Leiden (Netherlands). Lab. Astrophysics.
EXPERIMENTS ON CHEMICAL AND PHYSICAL EVOLUTION OF INTERSTELLAR GRAIN MANTLES
J. Mayo Greenberg *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 82-92 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26498# Edinburgh Univ. (Scotland). Dept. of Astronomy.
THE BEHAVIOUR OF THE 3.28 MICRON DUST FEATURE IN NGC 2024
P. W. J. L. Brand, D. H. Beattie (United Kingdom Infrared Telescope Unit), Ian Gatley (United Kingdom Infrared Telescope Unit), P. J. Meadows, and R. D. Wolstencroft (Royal Observatory) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 105-112 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26500# United Kingdom Infrared Telescope Unit, Hilo, Hawaii.
ORIGINS OF THE 3.28 MICRON DUST EMISSION FEATURE
Ian Gatley *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 118-127 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26501# University of Electro-Communications, Tokyo (Japan). Lab. of Applied Science.
QUENCHED CARBONACEOUS COMPOSITE (QCC): A LIKELY CANDIDATE FOR INTERSTELLAR GRAINS
Akira Sakata, Setsuko Wada, Toshihiko Tanabe (Tokyo Univ.), and Takashi Onaka (Tokyo Univ.) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 128-136 refs (For primary document see N84-26485 16-88)
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N84-26503# Kyoto Univ. (Japan). Dept. of Physics.
ORIGIN OF AMORPHOUS INTERSTELLAR GRAINS
Hiroichi Hasegawa *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 144-152 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26504# Kyoto Univ. (Japan).
NOVA AQUILAE 1982: THE NATURE OF ITS DUST
A. J. Longmore and P. M. Williams *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 153-157 refs (For primary document see N84-26485 16-88)
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N84-26505# Texas Univ., Austin. Dept. of Astronomy.
INFRARED POLARIMETRY OF YOUNG CLUSTERS
Harriet L. Dinerstein *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 158-161 refs (For primary document see N84-26485 16-88)
Copyright. Avail: NTIS HC A09/MF A01

N84-26507# Royal Observatory, Edinburgh (Scotland).
STRUCTURE IN THE INTERSTELLAR POLARIZATION CURVE AND THE NATURE OF THE POLARIZING GRAINS
Ramon D. Wolstencroft and Robert J. Smith (Marconi Space and Defence Systems) *In* Royal Observatory Proc. of the Workshop on Lab. and Observational Infrared Spectra of Interstellar Dust 1984 p 167-170 refs (For primary document see N84-26485 16-88)
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91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N84-26543*# Princeton Univ., N. J. Dept. of Geological and Geophysical Sciences.
THE ORIGIN OF MAGNEMITE ON MARS Final Technical Report, 1 Jul. 1979 - 31 Aug. 1981
Robert B. Hargraves 1984 3 p
(Grant NsG-7602)
(NASA-CR-173492; NAS 1.26:173492) Avail: NTIS HC A02/MF A01 CSCL 03B

An explanation for the magnetic properties of Martian surface material is discussed, specifically that the surface particles were composed primarily of smectite clay (nontronite) pigmented throughout by a red magnetic phase. The thermal treatment of nontronite in air, for long periods at 700 deg C or short periods at 900 deg C, results in destruction of the nontronite structure, a distinct reddening in color, and a spectacular increase in magnetic susceptibility and saturation magnetization (up to 4.4 Am squared/kg). Magnetic property measurements suggest that the magnetism is due to the presence of ultrafine particles of alpha or gamma Fe2O3; the precise identify was not resolved. Thermally treated nontronite has chemical, color and magnetic properties akin to those found by Viking on Mars. These results favor an origin for the fine grained Martian surface material by repeated impacts into an Fe-rich smectite-charged regolith, the smectite having resulted from hydrothermal alteration of volcanic or impact generated glass, the magnetic phase having resulted from the pressure or thermal shocked nontronite. R.J.F.

N84-26544*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER 1 IMAGING AND IRIS OBSERVATIONS OF JOVIAN METHANE ABSORPTION AND THERMAL EMISSION: IMPLICATIONS FOR CLOUD STRUCTURE
Robert A. West (Colorado Univ., Boulder), Peter N. Kupferman, and Helen Hart (Colorado Univ., Boulder) [1984] 84 p refs
(NASA-CR-173567; NAS 1.26:173567) Avail: NTIS HC A05/MF A01 CSCL 03B

Images from three filters of the Voyager 1 wide angle camera are used to measure the continuum reflectivity and spectral gradient near 6000 A and the 6190 A band methane/continuum ratio for a variety of cloud features in Jupiter's atmosphere. The dark barge features in the North Equatorial Belt have anomalously strong positive continuum spectral gradients suggesting unique composition. Methane absorption is shown at unprecedented spatial scales for the Great Red Spot and its immediate environment, for a dark barge feature in the North Equatorial Belt, and for two hot spot and plume regions in the North Equatorial Belt. Methane absorption and five micrometer emission are correlated in the vicinity of the Great Red Spot but are anticorrelated in one of the plume hot spot regions. Methane absorption and simultaneous maps of five micrometer brightness temperature is quantitatively compared to realistic cloud structure models which include multiple scattering at five micrometer as well as in the visible. Variability in H2 quadrupole lines are also investigated. Author

N84-26545*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VIBRATIONAL AND ROTATIONAL EXCITATION OF CO IN

COMETS. PART 1: NON-EQUILIBRIUM CALCULATIONS. PART 2: RESULTS OF THE CALCULATION FOR STANDARD BRIGHT COMET, COMET IRAS-ARAKI-ALCOCK AND COMET HALLEY
G. Chin and H. A. Weaver May 1984 155 p refs
(NASA-TM-86122; NAS 1.15:86122) Avail: NTIS HC A08/MF A01 CSCL 03B

The vibrational and rotational excitation of the CO molecule in cometary comae were investigated using a model which includes IR vibrational pumping by the solar flux, vibrational and rotational radiative decay, and collisional coupling among rotational states. Steady state was not assumed in solving the rate equations. The evolution of a shell of CO gas was monitored as it expanded from the nucleus into the outer coma. Collisional effects were treated using a kinetic temperature profile derived from theoretical work on the coma energy balance. The kinetic temperature was assumed to be extremely cold in the inner coma; this has significant consequences for the CO excitation. If optical depth effects are ignored, only low J transitions will be significantly excited in comets observed at high spatial resolution. Ground-based observations of CO co-vibrational and rotational transitions will be extremely difficult due to lack of sensitivity and/or terrestrial absorption. However, CO should be detectable from a large comet with favorable observing geometry if the CO is a parent molecule present at the 10% level (or greater) relative to H2O. Observations using cooled, spaceborne instruments should be capable of detecting CO emission from even moderately bright comets. R.S.F.

N84-26546# Naval Research Lab., Washington, D. C.
MHD (MAGNETOHYDRODYNAMIC) SIMULATION OF A COMET MAGNETOSPHERE
J. A. Fedder, S. H. Brecht, and J. G. Lyon 12 Apr. 1984 32 p (RR03302)
(AD-A140208; NRL-MR-5306) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper presents results of a numerical magnetohydrodynamic simulation of the interaction of the solar wind with a comet. It states that for a steady solar wind and interplanetary magnetic field (IMF) the cometary plasma has a distinctive structure; a spheroidal head and a long ribbon-like tail. Rotational discontinuities in the IMF lead to changes in the tail structure. It is shown how these effects occur and describe ray-like structures as well as a tail disconnection event. The simulation results provide a simple explanation for a number of observable features in cometary plasma tails. Author (GRA)

N84-26547 California Univ., Santa Barbara.
GEOLOGY OF THE OLYMPUS MONS REGION OF MARS Ph.D. Thesis
Kenneth Lloyd Tanaka 1983 294 p
Avail: Univ. Microfilms Order No. DA8401755

The origin of the extremely large perimeter scarp and surrounding aureole deposits of the Olympus Mons shield volcano have been mysteries since their discovery. Studies of Viking orbiter imaging, radar, and gravity acceleration data have provided a basis on which to address local stratigraphic, structural, erosional, and climatic history. In turn, geologic history, terrestrial analogs, and hypothetical simulations are used to ascertain the applicability of multiple working hypotheses. Mass movement emplacement of the aureoles is untenable for mechanical reasons, ash-flow deposition does not adequately explain the ridge and valley surface of the aureoles, and moberg-ridge volcanism requires a large ice-cap and an unlikely fracture pattern in basement rocks. A flood-lava model presented here can hypothetically explain: (1) the emplacement of the aureoles, (2) the formation of the surface ridge and valley structure, and (3) the presence of a near-surface source pluton to explain the positive gravity residual anomaly centered over a large, well-exposed aureole deposit. Dissert. Abstr.

N84-26548# Kansas Univ., Lawrence.
ANALYSIS OF VOYAGER OBSERVATIONS OF ION AND ELECTRON PHASE SPACE DENSITIES IN THE MAGNETOSPHERES OF JUPITER AND SATURN Ph.D. Thesis
Mark Thomas Paonessa 1983 217 p
Avail: Univ. Microfilms Order No. DA8403671

Data from the Low Energy Charged Particle experiment aboard the Voyager spacecraft were used to calculate ion and electron phase space densities in the magnetospheres of Jupiter and Saturn. These were calculated at constant first and non-zero second adiabatic invariants using real pitch angle and energy spectrum information. These calculations are used to infer the nature of charged particle sources, losses, and transport in the inner magnetospheric regions. At Jupiter the general nature of the transport is consistent with inward diffusion from the outer magnetosphere, combined with losses near the orbit of Io. These apparent losses are not consistent with simple satellite sweeping by Io alone. At Saturn the data are also consistent with a picture of inward diffusion from the magnetospheric boundary, though there is evidence for a source of low energy ions in the inner magnetosphere. Dissert. Abstr.

N84-26549# Princeton Univ., N. J.
RADIATIVE FORCING OF THE VENUS MESOSPHERE Ph.D. Thesis
David Crisp 1984 208 p
Avail: Univ. Microfilms Order No. DA8405108

Results from the Pioneer Venus mission show that polar regions are up to 20 deg K warmer than the tropics at most levels in the Venus mesosphere (60 - 100 km). A detailed radiative transfer model was used to determine how radiative forcing contributes to this feature. This model includes the effects of absorption, emission and scattering by carbon dioxide, water vapor, sulfur dioxide, sulfuric acid aerosols and an unidentified ultraviolet absorber. To test the accuracy of the methods used here, global-mean radiative equilibrium temperatures were found at levels between 55 and 100 km and compared to observations. These experiments (1) demonstrate the accuracy of the model, (2) show how each opacity source contributes to the thermal structure, and (3) indicate that computed global-mean temperatures are relatively insensitive to uncertainties in the mesospheric optical properties. Radiative equilibrium experiments show that meridional variations in radiative forcing act to destroy the observed reversed temperature gradients in the Venus mesosphere and produce polar temperatures which are up to 40 deg K cooler than those in the tropics. Dissert. Abstr.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-26550*# Aeronautical Research Labs., Melbourne (Australia).
ACCELERATION AND CONFINEMENT OF ENERGETIC PARTICLES IN THE 7 JUNE 1980 SOLAR FLARE
S. R. Kane (California Univ., Berkeley), K. Kai (Tokyo Univ., Mitaka), T. Kosugi (Tokyo Univ., Mitaka), S. Enome (Nagoya Univ., Toyokawa), P. B. Landecker, and D. L. McKenzie 31 Aug. 1983 42 p refs
(Contracts NAS5-25980; F04701-82-C-0083; F04701-81-C-0082; F19628-80-C-0208)
(NASA-CR-173545; NAS 1.26:173545; AD-B134318; SD-TR-83-66; TR-0083(3940-01)-2) Avail: NTIS HC A03/MF A01 CSCL 03B

Pulsations with large amplitude and duration were observed during the hard X-ray and microwave radio bursts associated with the solar flare. High time resolution measurements of 20 to 800 keV X-rays were made with the X-ray spectrometers aboard ISEE-3 and the P-78-1 spacecraft. Radio measurements, covering metric to microwave wavelengths, were made at the Nobeyama and Toyokawa observatories in Japan. The temporal evolution of the X-ray and the radio spectra and the polarization and spatial structure of the microwave source were examined. The following interpretation is found to be consistent with the observations: the variations in the electron acceleration/injection spectrum are responsible for the observed variations in the hard X-ray and

microwave emissions; and the locations of the hard X-rays and microwave sources are probability different, the X-ray source being located at a lower altitude. Author

N84-26551# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TIMING ANALYSIS OF HARD X-RAY EMISSION AND 22 GHz FLUX AND POLARIZATION IN A SOLAR BURST
J. E. R. Costa, P. Kaufmann, and T. Takakura (Tokyo Univ., Japan) May 1984 22 p refs Submitted for publication
(INPE-3103-PRE/502) Avail: NTIS HC A02/MF A01

A solar flare occurring on 26 February 1981 at 1932 UT was observed simultaneously in hard X rays and microwaves with a time resolution of a fraction of a second. The X ray observations were made with the Hard X ray Monitor on Hinotori, and the microwave observations were made at 22 GHz with the 13.7m Itapetinga mm-wave antenna. Timing accuracy was restricted to 62.5 ms, the best time resolution obtained in hard X rays for this burst. The principal results are the following: (1) all 22 GHz flux structures were delayed by 0.2 to 0.9 second relative to similar structures in hard X rays throughout the burst duration; (2) different burst structures showed different delays, suggesting that they are independent of each other; (3) the time structures of the degree of polarization at 22 GHz precede the total microwave flux time structures by 0.1 to 0.5 sec; (4) plots of time delays against time obtained every 125 ms for microwaves relative to hard X rays, and for microwave polarization degree relative to total microwave flux show fluctuations which are not clearly correlated to any of the other time structures. Author

N84-26552*# Systems and Applied Sciences Corp., Hyattsville, Md.
USER'S GUIDE FOR ERB-7 SEFDT. VOLUME 3: QUALITY CONTROL REPORT FOR YEAR-2
Kunigahalli L. Vasanth Apr. 1984 80 p
(Contract NAS5-28063)
(NASA-CR-170618; NAS 1.26:170618) Avail: NTIS HC A05/MF A01 CSCL 03B

Problems in the solar data generated by the Nimbus 7 satellite are discussed specifically for scientific users. Major and minor data flaws in the Solar and Earth Flux Data Tape (SEFDT) were identified, defined and categorized. Solar channel assembly misalignment, data gaps, and algorithm errors were among the problems described in detail. Solar flux density data derived from SEFDT are presented in graphical form. R.S.F.

N84-26553*# Systems and Applied Sciences Corp., Hyattsville, Md.
USER'S GUIDE FOR ERB 7 SEFDT. VOLUME 1: USER'S GUIDE. VOLUME 2: QUALITY CONTROL REPORT, YEAR 1
S. N. Ray, Richard J. Tighe, and Steven A. Scherrer 1984 191 p refs
(Contract NAS5-28063)
(NASA-CR-170616; NAS 1.26:170616) Avail: NTIS HC A09/MF A01 CSCL 03B

The Nimbus-7 ERB SEFDT Data User's Guide is presented. The guide consists of four subsections which describe: (1) the scope of the data User's Guide; (2) the background on Nimbus-7 Spacecraft and the ERB experiment; (3) the SEFDT data product and processing scenario; and (4) other related products and documents. E.A.K.

N84-26554*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COALESCENCE OF TWO PRESSURE WAVES ASSOCIATED WITH STREAM INTERACTIONS
Y. C. Whang and L. F. Burlaga Apr. 1984 34 p refs
(NASA-TM-86120; NAS 1.15:86120) Avail: NTIS HC A03/MF A01 CSCL 03B

An MHD unsteady 1-D model is used to simulate the interaction and coalescence of two pressure waves in the outer heliosphere. Each of the two pressure waves was a compression region bounded by a shock pair. Computer simulation using Voyager data as input demonstrates the interaction and coalescence process involving one pressure wave associated with a fast stream and the other pressure wave without a fast stream. The process produced a significant change in the magnetic field and plasma signatures. The propagation of the forward and reverse shocks first widened the radial dimension of the shock compression region with increasing heliocentric distances. The shocks belonging to two neighboring compression regions eventually collided and two compression regions began to overlap with each other. This type of interaction is a dominant dynamical process in the outer heliosphere, and significantly and irreversible alters the structure of the medium. Author

N84-26555# Boston Coll., Chestnut Hill, Mass.
THREE COMPONENT SOLAR WIND MODEL Ph.D. Thesis
Koduvayur Ganapathy Iyer Narayana 1983 159 p
Avail: Univ. Microfilms Order No. DA8405183

A three component solar wind model, with alpha particles, protons and electrons, is investigated analytically. Model assumptions include spherical symmetry, isothermal temperatures for each component, and the polarization electrostatic field as the only coupling force. Conditions for the simultaneous possible critical flow speeds and critical distances were derived. Topologies for the possible proton and alpha critical speeds are derived analytically. The existence of two critical points for the three components solar wind model was established. From the derived analytical expression for the critical distances at six points on the possible critical flow speed curve, conditions for the allowable ranges of alpha to proton temperature ratio, for the existence of a solar wind type solution are derived. Analytical expressions for solar wind asymptotic solution are derived. Further simplification of this model is done assuming that the alpha particles are a minor species and that the flow of protons and electrons are not affected by the presence of the alpha particles. Dissert. Abstr.

N84-26556# Kansas Univ., Lawrence.
THE GEOMAGNETOSYSTEM: CHARGED PARTICLE TRAJECTORIES IN THE GEOMAGNETIC TAIL Ph.D. Thesis
Keith Eugene Propp 1983 214 p
Avail: Univ. Microfilms Order No. DA8403673

The interaction between the solar wind and the magnetic field of the Earth results in the formation of a long tail like structure extending antisolarward. Of central importance in the explanations of the causes and processes involved in the Earth's aurorae is the study of the manner in which the magnetotail is formed and maintained. A realistic model of the steady state magnetic field structure is formulated. The magnetic field model is comprised of the geomagnetic dipole field, the field due to the forward magnetopause currents, and the field due to the magnetotail current system. The values and derivatives of the model magnetic field are made available for any position within the geomagnetosystem as the output from specially designed computer subprograms. By numerically integrating both the exact and the guiding center approximation equations of motion the motions of protons with energies from 2 eV to 20 keV were studied. Dissert. Abstr.

N84-26510*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
APPLICATION OF A GLOBAL SOLAR WIND/PLANETARY OBSTACLE INTERACTION COMPUTATIONAL MODEL: EARTH, VENUS, MARS, JUPITER AND SATURN STUDIES
Stephen S. Stahara *In its* Appl. of a Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 11p refs
(For primary document see N84-26509 16-88)
Avail: NTIS HC A08/MF A01 CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-26557*# Stanford Univ., Calif. Center for Space Science and Astrophysics.
EXTRAGALACTIC RADIO SOURCES
P. A. Sturrock Apr. 1984 21 p refs Submitted for publication
(Grant NGR-05-020-668)
(NASA-CR-173606; NAS 1.26:173606; CSSA-ASTRO-84-04) Avail: NTIS HC A02/MF A01 CSCL 03B

The standard model for extragalactic variable radio sources comprises an isotropically expanding plasmoid with frozen magnetic flux and an electron distribution which evolves adiabatically. This model leads to the following relaton between the peak luminosity L (sub nu, m) and the relevant frequency nu(sub m) which are functions of time: L(sub nu,m) is proportional to nu(sub m)(n) where N = (7n + 5)/(4n + 5). In this expression, n is the spectral index in the optically thin part of the spectrum, where L (sub nu) is proportional to nu (-n). For n in the range 0.5 to 1.5, the standard model yields N in the range 1.2 to 1.4. By contrast, analysis of observational data yields estimates of N in a small range about the mean value 0.4, in clear contradiction with the standard model. Author

N84-26558*# Wisconsin Univ., Madison. Dept. of Physics.
LIMITS ON SOFT X-RAY FLUX FROM DISTANT EMISSION REGIONS
D. N. Burrows, D. McCammon, W. T. Sanders, and W. L. Kraushaar 7 May 1984 38 p refs
(Grant NGL-50-002-044)
(NASA-CR-173591; NAS 1.26:173591) Avail: NTIS HC A03/MF A01 CSCL 03B

The all-sky soft X-ray data of McCammon et al. and the new N sub H survey (Stark et al. was used to place limits on the amount of the soft X-ray diffuse background that can originate beyond the neutral gas of the galactic disk. The X-ray data for two regions of the sky near the galactic poles are shown to be uncorrelated with 21 cm column densities. Most of the observed x-ray flux must therefore originate on the near side of the most distant neutral gas. The results from these regions are consistent with X-ray emission from a locally isotropic, unabsorbed source, but require large variations in the emission of the local region over large angular scales. M.G.

N84-26559*# Stanford Univ., Calif. Center for Space Science and Astrophysics.
HARD X-RAY AND MICROWAVE MORPHOLOGY
Vane Petrosian Feb. 1984 39 p refs
(Grants NsG-7092; NSF ATM-82-18125)
(NASA-CR-173568; NAS 1.26:173568; SU-CSSA-ASTRO-84-08) Avail: NTIS HC A03/MF A01 CSCL 03B

An in depth analysis of data (and comparison with observation) from SMM and Hinotori on the Hard X-ray and Microwave Morphology of the flares was conducted. Author

N84-26560*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NUCLEAR PROCESSES IN THE JETS OF SS433
R. Ramaty, B. Kozlovsky, and R. E. Lingenfelter May 1984 15 p refs Submitted for publication
(NASA-TM-86109; NAS 1.15:86109) Avail: NTIS HC A02/MF A01 CSCL 03B

The very narrow gamma-ray lines observed at 1.495 and 6.695 MeV from SS433 which are blueshifted 1.369 and 6.129 emissions from deexcitations of (24)Mg* and (16)O* in grains moving with the jets and inelastically excited by interactions with the ambient medium are discussed. Energetic particle interactions in grains produce very narrow gamma ray lines from deexcitation of nuclear levels whose lifetimes are long enough that the excited nuclei stop before deexcitation. The presence of grains in the jets resolves hitherto discussed difficulties of inelastic excitation models for gamma ray production in SS433, the very narrow widths of the observed lines and the absence of other strong lines, expected from abundant elements. A model is proposed which could be distinguished from a previously proposed fusion model by gamma ray line observations. E.A.K.

N84-26561*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC RAYS AND THE EMISSION LINE REGIONS OF ACTIVE GALACTIC NUCLEI
G. J. Ferland (Kentucky Univ.) and R. F. Mushotzky May 1984 54 p refs Submitted for publication
(NASA-TM-86110; NAS 1.15:86110) Avail: NTIS HC A04/MF A01 CSCL 03B

The effects that the synchrotron emitting relativistic electrons could have on the emission line regions which characterize active nuclei are discussed. Detailed models of both the inner, dense, broad line region and the outer, lower density, narrow line region are presented, together with the first models of the optically emitting gas often found within extended radio lobes. If the relativistic gas which produces the synchrotron radio emission is mixed with the emission line region gas then significant changes in the emission line spectrum will result. The effects of the synchrotron emitting electrons on filaments in the Crab Nebula are discussed in an appendix, along with a comparison between the experimental calculations, which employ the mean escape probability formalism, and recent Hubbard and Puetter models. M.A.C.

N84-26562*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TOPEX ORBITAL RADIATION STUDY
E. G. Stassinopoulos and J. M. Barth (Science Systems and Applications, Inc.) Apr. 1984 163 p refs
(NASA-TM-85447; X-601-84-10; NAS 1.15:85447) Avail: NTIS HC A04/MF A01 CSCL 03B

The space radiation environment of the TOPEX spacecraft is investigated. A single trajectory was considered. The external (surface incident) charged particle radiation, predicted for the satellite, is determined by orbital flux integration for the specified trajectory. The latest standard models of the environment are used in the calculations. The evaluation is performed for solar maximum conditions. The spacecraft exposure to cosmic rays of galactic origin is evaluated over its flight path through the magnetosphere in terms of geomagnetic shielding effects, both for surface incident heavy ions and for particles emerging behind different material thickness. Limited shielding and dose evaluations are performed for simple infinite slab and spherical geometries. Results, given in graphical and tabular form, are analyzed, explained, and discussed. Conclusions are presented and commented on. M.A.C.

N84-25890*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Application Section.
ARCSECOND POSITIONS FOR MILLIARCSECOND VLBI NUCLEI OF EXTRAGALACTIC RADIO SOURCES, PART 2: 207 SOURCES
D. D. Morabito, R. A. Preston, M. A. Slade, D. L. Jauncey (CSIRO, Sydney), and G. D. Nicolson (CSIR, Johannesburg) *In its* The Telecommun. and Data Acquisition Rept. 15 Mar. 1984 p 1-11 refs (For primary document see N84-25889 16-32)
Avail: NTIS HC A08/MF A01 CSCL 20N

N84-26512*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
CHARACTERISTICS OF THE MAGNETOSPHERIC SOURCE OF INTERPLANETARY ENERGETIC PARTICLES
J. G. Luhmann, R. J. Walker, C. T. Russell, N. U. Crooker, J. R. Spreiter (Stanford Univ.), Stephen S. Stahara (Neilsen Eng. and Res., Inc.), and D. J. Williams *In* Neilsen Eng. and Res., Inc. Appl. of A Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 18p Prepared in cooperation

with California Univ., Los Angeles (For primary document see N84-26509 16-88)
Avail: NTIS HC A08/MF A01 CSCL 03B

N84-26515*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
THE MAGNETIC FIELD OF MARS: IMPLICATIONS FROM GASDYNAMICS MODELING
C. T. Russell, J. G. Luhmann, J. R. Spreiter (Stanford Univ.), and Stephen S. Stahara (R.M. Assoc.) *In* Neilsen Eng. and Res., Inc. Appl. of A Global Solar Wind/Planetary Obstacle Interaction Computational Model May 1984 24p refs (For primary document see N84-26509 16-88)
(Grants NAGw-278; NSF ATM-82-10691)
Avail: NTIS HC A08/MF A01 CSCL 03B

99 GENERAL

N84-26563*# National Aeronautics and Space Administration, Washington, D. C.
NASA, THE FIRST 25 YEARS: 1958 - 1983
Jane DAlelio, comp., Jane Tully, comp., and Wendy Cortesi, comp. 1983 130 p
(NASA-EP-182; NAS 1.19:182) Avail: NTIS MF A01; SOD HC $8.00 as 033-000-00909-7 CSCL 05D

Because it is impossible to describe the 25 years of NASA's research and missions in detail, this book is designed to provide a reference base from which teachers can develop classroom concepts and activities. It begins with a prologue, a brief history of the National Advisory Committee for Aeronautics, NASA's predecessor. Succeeding chapters are devoted to major NASA programs, in alphabetical order; within the chapters projects are listed chronologically. Each chapter concludes with ideas for the classroom and space for notes and new information the user may wish to add. Author

N84-26564*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LANGLEY AERONAUTICS AND SPACE TEST HIGHLIGHTS, 1983
Jun. 1984 80 p
(NASA-TM-85806; NAS 1.15:85806) Avail: NTIS HC A05/MF A01 CSCL 05B

The role of the Langley Research Center is to perform basic and applied research necessary for the advancement of aeronautics and space flight, to generate new and advanced concepts for the accomplishment of related national goals, and to provide research advice, technological support, and assistance to other NASA installations, other government agencies, and industry. Some of the significant tests which were performed during calendar year 1983 in Langley test facilities, a number of which are unique in the world are highlighted. Both the broad range of the research and technology activities at the Langley Research Center and the contributions of this work toward maintaining United States leadership in aeronautics and space research are illustrated.R.J.F.

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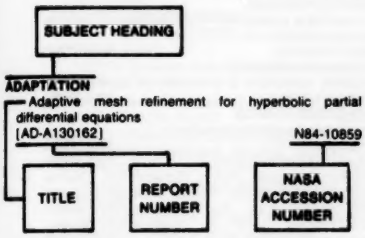

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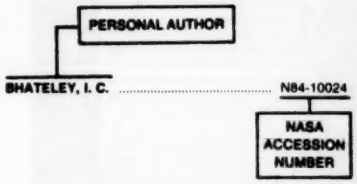

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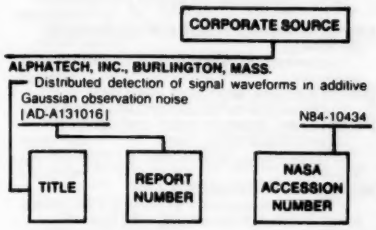

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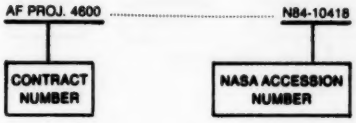

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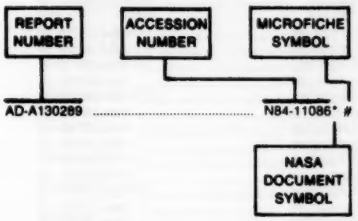

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